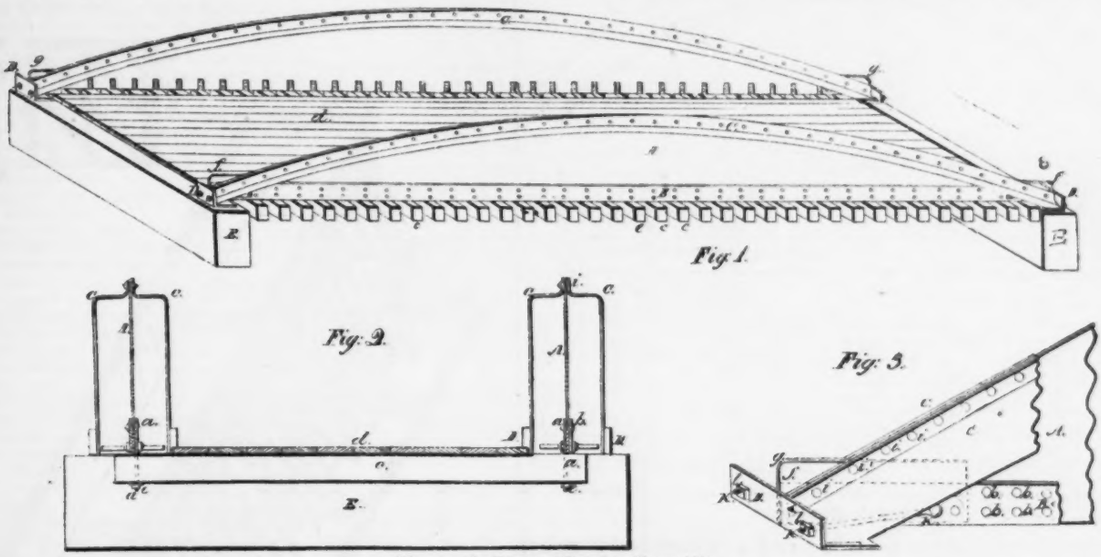
TRUSS BRIDGES.

The nature of George P. Herthel, Jr.'s invention (November 20, 1886), is in a peculiar arrangement and shaping of the parts of the bridge in such wise that strains, which vary in intensity at the various points of the entire span, shall, nevertheless, exert a nearly constant effect upon the material of the structure, so that, therefore, the amount of strain being equalized, it will permit uniformity of material and patterns for castings.

In the application of cast iron to a truss, if the strain thereon be unduly taken, the material is unable to withstand it, and breakage or injury results.

The upper chord is constructed of a series of bars *F* which have polygonal sides of a parabolic curve. At the ends of the truss the bars rest upon end pieces *G*, which receives also the lower chord or stringer *H*. One of these blocks *G* rest upon rolls to allow for contraction and expansion.



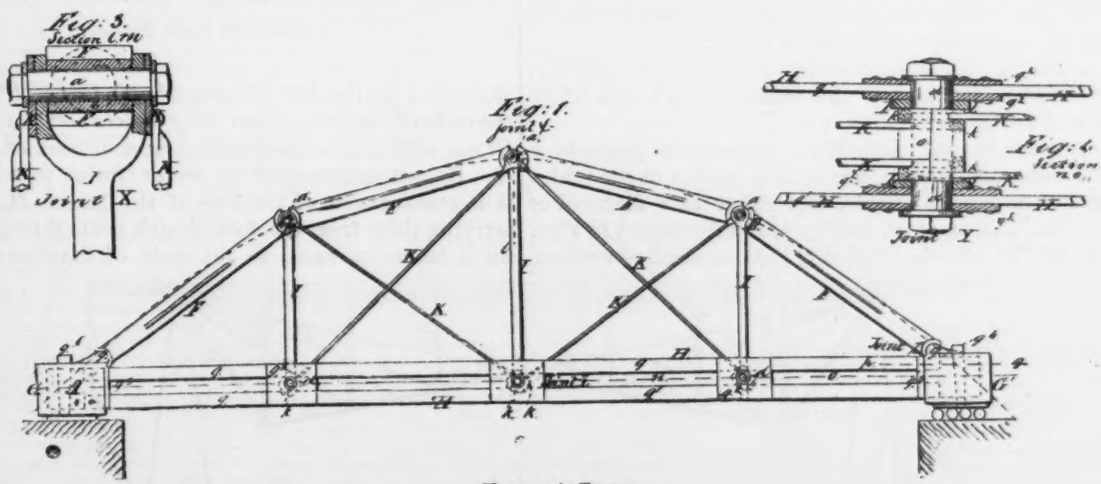
MOSELEY'S BRIDGE TRUSS—(Page 410).

The bracing is composed of a serie of vertical posts *I* and inclined brace-rods *K*.

The posts are intended to and do usually resist a compressive strain, caused by the tendency of the chords to lengthen. Now, as owing to a non-action of one of the adjoining tension braces *K*, a tensional strain may be thrown upon *I*, the posts are connected with the chords *F* and *H*, and races *K* in a manner to fully act under the strain. The chord bars *F* receive and transmit strain to other parts of the truss at points *X* in the following manner: *a* is a central bolt rod, which passes through eyes in the upper ends of the braces *K*. Thus all strains transmitted by the braces to the bolts *a* will in nowise act to twist the bar *F*. The posts are made with forked ends.

The next invention here considered is that granted George P. Lape Dec. 4, 1866. Lapé's patent is for an improvement in cast-iron arches for building bridges, aqueducts, and like structures. A cast-iron *voussoir* or section of an arch is made of such conformation that one *voussoir* shall constitute a unit of construction. Each *voussoir* is an arc of a circle; the traverse ends are planes in the lines of the radii thereof, and the longitudinal sides are parallel with each other. The general proportions and dimensions for ordinary work will be about four feet long, two feet wide on the ends; and eighteen inches deep, with a center rib or stem as deep as the ends, three inches wide at the bottom, and half an inch thick in the welt.

Referring to the cuts, *A* represent the *voussoirs*; they are cast in one piece, and in transverse sections they are



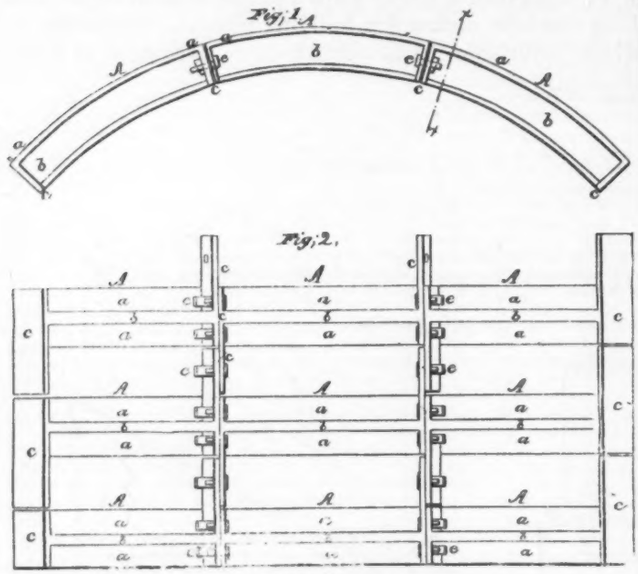
HERTHEL'S TRUSS.

T-shaped. *a* is the top, and *b* a rib or stem at right angles to the top, running lengthwise from end to end. The ends *c c* are flat plates which abut against each other in an arch, and are fastened together by three links and keys *e e* at each end. The ends extend further on one side of the stem or rib *b* than the other, in order to form laps for the middle bolt, and to break joints in the ends of the *voussoirs*.

Lapé's invention will expire Dec. 4, 1883.

The construction of O. G. Leopold's bridge is based upon the theory of the neutral line or point of gravity of the cross-section of a loaded beam supported at its ends,

and for its form the double-shaped cross-section or I-beam was adopted as the strongest with reference to the metal expended. To these as the leading ideas, the whole structure is made to conform in its combinations, as well as its



LAFÉ'S BRIDGE.

minor parts, to produce a strong and comparatively light structure.

The top range or flange a^4 of the upper stringer may be made of either flat iron (Fig. 1) or of tubular form (Figs. 5, 6, 7 and 8), the latter preferred for reason of compensating for (with less expenditure of metal) the difference in strength that wrought-iron presents to an expansive strain, thus balancing that portion of the cross-section of the girder lying above the point of gravity to that lying below the same, or in other words, bringing the neutral line in the middle of the cross-section of the beam. This line, from the manner in which the load operates upon the resisting strength of the beam, being the line of stability, is selected for the attachment of the roadway, thus laying the load upon the strongest point of the girder.

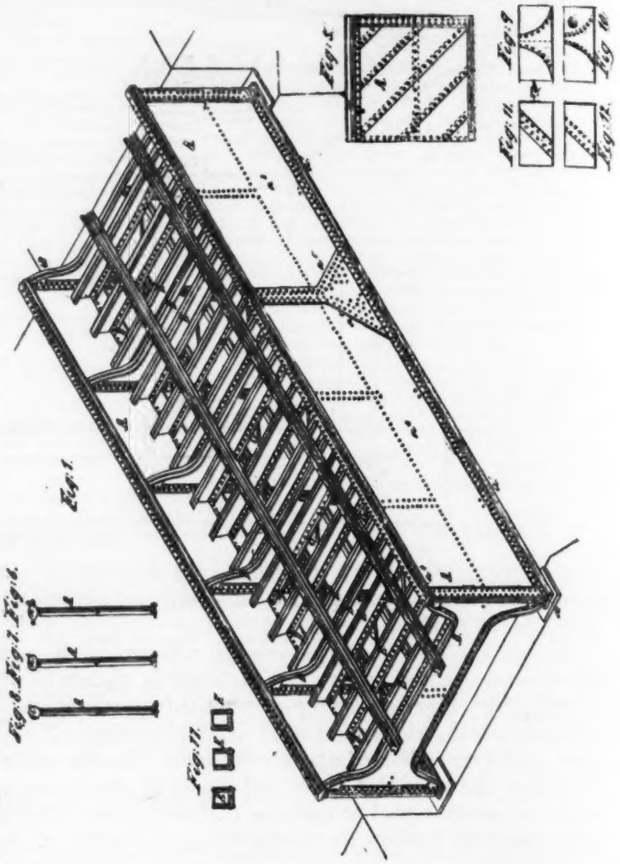
On the inner side of each girder, at the line of stability, a flat bar D is fastened to the central rib a^3, and which serves as a carrier to the cross-ties E.

No joints are formed in the lower stringers or plates in a straight right angular line, nor in any portion of the bridge exposed to expansive strains, but either in a diagonal or circular line, as seen at a^5, in Fig. 1, and illustrated in Figs. 9, 10, 11 and 12, thereby obviating the comparative weakening of those points. The cross sills E (Fig. 17) are made hollow of heavy planking, with a light metal top. in order to secure lightness and elasticity to the rail,

December 11, 1866, Frederick H. Smith patented a suspension truss, an illustration of which is here given.

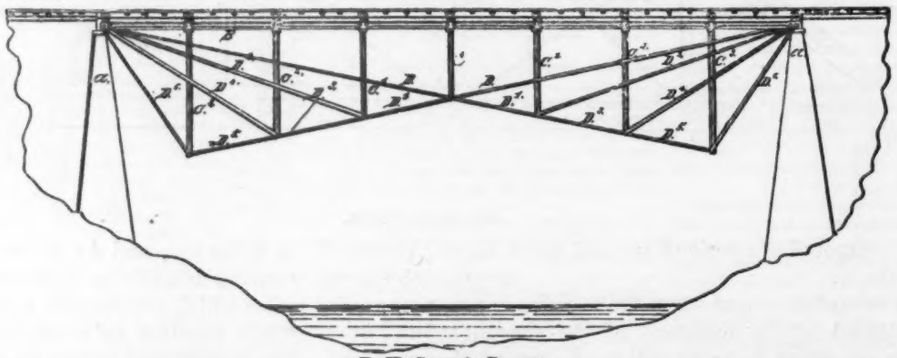
The patent expires Dec. 11, 1883.

The operation of the component parts of the truss is as follows: The post C is supported from the ends of the straining beams B by the bars or braces D D. The posts C^1 C^1 are suported from the foot of post C by braces D^1, which are prolongations of braces D, and form the ends of the straining beam B, by the braces D^2. The posts C^1 C^1 are



LEOPOLD'S TRUSS BRIDGE.

supported by the feet of posts C^1 and braces D^3, and from the ends of straining beam B by braces D^4; and the posts C^2 are similarly supported by braces D^5 and D^6 from beam B. By concentrating all the center strains in a line, which is a prolongation of the line of the braces D, in lieu of carrying them from the foot of each post, through separate small braces or bars, to the ends of the straining beam,



F. H. SMITH'S BRIDGE.

great advantages are said to be secured, such as simplicity and consequent facility of construction, economy of material, and more security from injury to the structure from sudden changes of temperature, as the material is disposed in large masses.

[THE END.]

JAY GOULD'S START IN LIFE—A HINT TO YOUNG SURVEYORS.

The Senators of the Labor and Education Committee waited an hour in the Post-Office building on the 5th, before Jay Gould came quietly into the room and took a seat in a far corner. Senator Blair escorted the millionaire to the witness stand, reporters crowded about him, and the audience leaned forward to see and hear him. Mr. Gould was dressed in a plain suit of striped diagonal. A heavy gold watch chain dangled at his waistcoat and eye-glasses swung from a silk thread thrown around his standing collar. Large round buttons set with a circle of tiny diamonds and rubies glittered in his white cuffs. He sipped some ice water, looked laughingly about at the reporters, and told Senator Blair that he hadn't read the resolution under which the Senators were detailed to conduct their examination. Senator Blair read the resolution. Then he said:

"Mr. Gould, will you tell the committe something of your earlier life?"

"Yes, if you wish," said the witness. "It's rather silly to talk over such small matters. I don't like to parade myself before the public. But I'll jump in and do the best I can. I was born in Roxbury, Delaware County, New York, May 27, 1836. My father was a small farmer, who had a dairy of twenty cows. As a boy, it was my duty to drive these cows and assist my sisters in milking them. I went about barefooted and often got thistles in my feet. I didn't like that kind of farming, and so one day I said to my father that I'd like to go to school. He said I was too young. I said if he'd give me my time I'd try my fortune. 'All right; go ahead,' said he, and the next day I started out. I found a blacksmith who, as I wrote a good hand, would board me if I wrote up his books at night. In that way I worked my way through a small select school. I was 14 years old when I started out, and at 15 I got a clerkship in a country store. I made myself generally useful sweeping it out and looking after business, working from 6 o'clock in the morning until 10 o'clock at night.

"I had a taste for mathematics, and got up at 3 o'clock in the morning and studied until 6 o'clock. I soon had a pretty good idea of engineering and started out as a surveyor. I heard of a man in Ulster County who was looking for an assistant, and I got an engagement from him at '$20 a month and found.' After some debate I concluded it best to take only enough money with me to pay my fare. When my employer sent me out to make surveys for a map of Ulster County he gave me a little passbook, and said: 'As you go along you get trusted for what you eat and your lodgings, and I'll follow you afterward and pay the bills.' On the third day out I attempted to get trust for two and sixpence, which was the usual charge for board and lodging in those days. 'No,' cried the farmer, 'you've got money and you must pay. Don't you know that the man you're working for has failed three times, and owes everybody in the county?' I turned my pockets inside out and said: 'There, I've got nothing. You can see that I've told you the truth.' From that little incident it seemed to me then that the world had about come to an end. I hadn't the heart to ask any one for a dinner. The rebuff had such a great effect on me that, after debating whether I should go ahead or give up, I sat down in the woods where nobody could see, and had a good cry."

Mr. Gould sank his voice to a whisper at this point, and in a hesitating and trembling tone continued: "I thought of another remedy, and knelt down then and there and prayed a little. When I got up I felt better, and made up my mind to go right ahead. I went into the nearest farmhouse, and the woman who met me gave me some bread and milk and treated me kindly. When I said that I would pay for it another time she said that it was all right, and I started off. I had got about forty rods when I heard her husband hallooing after me. After my previous experience I thought that he would about finish me. But he simply said: 'I want you to take your compass and make me a noon mark to tell time by.' I went back and made it. 'How much is that?' he asked. 'Oh, that's all right,' I replied. 'No, it 'aint,' he said, 'the regular surveyor charges a dollar for such work.' 'Well, then, that's the price,' I responded. He took out a shilling for what I had eaten and gave me seven shillings.

"That," exclaimed Mr. Gould, leaning back in his chair, "is the first money I ever earned. I went on that way and paid my expenses throughout the summer by making noon marks. At the end of the summer my employer had failed and couldn't pay me. Two other surveyors working for him, who were the sons of rich men, adopted my proposition to go on ourselves and finish our surveying and get out the maps. They wanted to put their names to the maps when they were done and I sold out my interest to them for $500. That represented my earnings for the summer. Afterward I made similar surveys and maps of Albany nd Delaware counties. They sold well and I got $5,000 out of their sale. Later on I met Zadock Pratt, of Prattsville, who was one of the largest tanners in the country. He knew all my history and took a fancy to me. He proposed to me to go into the tannery business with him and I did so. I bought up a large tract of hemlock land in Pennsylvania and with 50 or 60 men began to build a tanning mill. We built the blacksmith shop first and I slept in it on a bed of hemlock boughs the night of the day it was finished. Finally I bought Pratt out and subsequently sold the business to Leupp, a New York leather merchant. Just about this time the panic of 1857 occurred and Leupp committed suicide.

"I still had my early love for engineering," continued the witness, "and I had been watching the railroads. The Rutland & Washington road to Troy was offering its first-mortgage bonds at ten cents on the dollar. I bought them all on credit at that figure, and then became the president, treasurer, general superintendent and owner of a road about sixty miles long. I set out to learn the railroad business. I gradually developed the road, and when it became part of the Rensselaer & Saratoga, I sold out my stock at 120 and went West. The Cleveland & Pittsburgh road was in a poor condition, and a friend who had stock in it came to me one night and said he would have to fail next day if he didn't get rid of it. I bought this friend's interest. The stock was then at 65. I gradually developed the road and its business, and it paid dividends at once. The stock was up to 120 when I sold out."

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES, M. AM. SOC. C. E.

(*Continued from page* 412.)

DLXI.—DOVER, N. H.

Dover, New Hampshire, in lat. 89° 10′ N., long. 75° 30′ W., is on the Cocheco River. Settled in 1623, it was incorporated a city in 1855.

Water-works were built in 1828 and 1831 by three private companies, taking the supplies from springs and distributing it to residences only. The first pipe laid was of wood, which has since been replaced by cast iron. There are now 30 miles in use, of from 8 to 4 inches diameter, with 75 gates and 1,000 taps. There are nine meters in use. Service pipes of lead and wrought iron are used. There are no fire hydrants.

The population in 1880 was 11,687. The consumption is not known.

The capital stock of the three companies is respectively $30,000, $20,000 and $6,000.

The cost of the works is not known. The receipts in 1882 aggregated $12,000. The expenses of the largest company were $4,000 and its receipts $7,000.

The officers of the companies are respectively, (1), James E. Lothrop, President, and J. K. Purinton, Treasurer and agent; (2), Leonard S. Rand, President, and Alvah Moulton, Treasurer, and (3), Nathaniel Twombly, President, and Joseph Mann, Treasurer.

DLXII.—MANISTEE, MICH.

Manistee, Michigan, in lat. 44° 15′ N., long. 86° 20′ W., is on Lake Michigan at the mouth of the Manistee River.

Settled in 1841, it was incorporated a city in 1869.

Water-works were built by a private company in 1882-3, after plans of P. H. Linneen, taking the supply from a well 30 ft. in diameter and 36 ft. deep, in the bottom of which a 1¼ and a 2-in. pipe is driven 12 ft. deeper. A pipe is also laid to connect the well with the Manistee River.

The water is pumped directly into the mains by a Holly Steam Engine, driving 4 pumps of 14 in. bore and 25 in. stroke, and 2 pumps of 8 in. bore and 12. in stroke. The ordinary pressure maintained is 70 lbs. and fire pressure 140 lbs.

Distribution is by 9 miles of cast iron pipe of 16 to 6 inch diameter, with 58 fire hydrants, 18 gates and 125 taps. The town pays $100 a year for each hydrant. Service pipes are of galvanized iron.

The population in 1880 was 6,930. It is claimed to be 12,000 now. The daily consumption is not yet determined.

The capital stock of the company is $200,000. The works have cost $150,000. The bonded debt is $55,000 at 6 per cent. interest.

A. O. Wheeler is President, and G. A. Hart Secretary of the company.

TIME CONVENTIONS of railroad managers will be held in Chicago and New York in October. The principal question to be considered will be regarding the adoption of a uniform standard of time for railroads. The existing arrangement of time standards is a constant source of vexation and annoyance both to travelers and railway officials. The proposed standards are as follows: Intercolonial, 60 degrees west from Greenwich; Eastern, 75 degrees from Greenwich; Central, 90 degrees west from Greenwich; Mountain, 105 degrees west from Greenwich; and Pacific, 120 degrees west from Greenwich.

PUMPING ENGINE TEST.

We condense from the Fall River *Evening Daily News* the following with reference to the pumping engine recently erected in that city by the Davidson Steam Pump Company, of Brooklyn, N. Y.:

The pumping machine consists of two double outside plunger compound condensing engines, provided with a simple and ingenious device, by means of which they may be run either singly or duplex, the change from one condition to the other being made at will.

The machines are very handsome in appearance and finished in a superior manner. The dimensions are as follows: Diameter of initial cylinder, 26 in.; diameter of expansion cylinder, 48 in.; diameter of plungers, 22 in., and length of stroke, 36 in.

The guaranteed capacity of each pump is 2½ million gallons of water in 24 hours, at a piston speed of 90 ft. per minute, or 5 million gallons for the two pumps in 24 hours. This guarantee has been fully sustained, the pumps having at times delivered water at the rate of about 6½ millions in the given time. One marked feature in these pumps is that the plungers work *outside* the water cylinders, so that there can be no possible "slip" in the water ends, as occurs in all pumps when the plungers work *inside* the water cylinders. Therefore these pumps are accurate water meters, and send all the water credited to them through the mains.

The trial lasted for twelve consecutive hours, commencing at 8 a. m. and ending at 8 p. m. Total number of strokes, 44,588; average number of strokes per minute, 61.92; average length of stroke, 36¼ inches; capacity of pump per stroke, 60,064 gallons; total amount of water pumped, 2,678,133 gallons, or 22,335,634 pounds. The total lift, including friction in force mains—although the pond is somewhat lower, assumed to be the same as at the previous trial—217.52 feet. Total weight of coal burned 6,817 pounds; duty 71,269,579 pounds of water raised one foot high with 100 pounds of coal, an excess of about 11 per cent. over guarantee, which was 65,000,000 pounds.

The Davidson pumps have each their own suction and delivery pipes and check valves, which would materially add to the friction, but for which the company asks no credit. During the trial the fires were cleaned twice in one furnace and once in the other, and when inspected at expiration of trial were pronounced in good order, the slice bar being run through them to show their condition. The Mayor and other members of the city government were present when the test was concluded, and expressed themselves highly gratified at the result.

THE WATER-SHED OF THE 'ARABAH.

Apropos to the Palestine Canal is the following extract from Murray's "Handbook for Travelers in Syria and Palestine, London," 1868, page 59, part I.:

"It has been recently assertained by barometrical measurement that the water-shed of the 'Arabah, which is nearly in the parallel of Petra, has an elevation of 787 ft., and is thus no less than 2,079 ft. above the surface of the Dead Sea. In the face of such a fact, it is impossible to believe in any ancient connection between the Jordan and the Red Sea. But in addition to this M. Lartet has shown by his geological researches that the water-shed barrier is composed of calcareous strata, coeval in their present position with the physical structure of the whole surrounding country; and he has shown, too, what every observant traveler may see for himself, that from the direction of the lateral valleys both north and south of the water-shed, the Jordan could never have run into the Gulf of Akabah."

THE CANADA, LA CROSSE & SOUTHWESTERN RAILROAD has filed articles with the Secretary of State of Wisconsin. The line is to extend from La Crosse, traversing the counties of La Crosse, Trempealeau, Jackson, Clark, Taylor, Marathon, Lincoln, Langlade and Oconto, to a point in Marinette County, on the State line of Michigan, being about 275 miles in Wisconsin. The line will then continue northeast to Sault Ste. Marie, a further distance of about 225 miles, making a total length of 500 miles. The principal place of business will be at La Crosse. The act of incorporation takes effect Sept. 5, 1883, and continues 100 years. The capital stock is 125,000 shares, valued at $100 per share. Eighty-five thousand shares are to be common, and 40,000 shares preferred stock. The persons forming the corporation are Joseph Clark, M. Huderson, G. R. Montague, G. F. Gund, Albert Hirshheimer, of La Crosse; J. L. Gates, Neilsville; W. T. Price, W. J. Thompson, and C. F. Ainsworth, of Black River Falls; W. H. Roach and James Wadsworth, of New York City; L. W. Reynolds, Boone, Iowa; F. H. Roziene, Charles City; James McCord, La Crosse. The government of the road is vested in eleven directors, Mr. Wadsworth to represent a number of New York City capitalists. Work on the new line will be pushed.

SEWERAGE PLANS WANTED.

Some months ago the Trenton (N. J.) *State Gazette* gave the Sanitary Committee of the Common Council of that city some excellent advice regarding the preparation of a plan for the sewering of the city, telling them very sensibly that they needed the advice of a good civil engineer, "not a mere theorist," but one who has had experience in the designing and construction of sewers, and that "it would be profitable in the long run to employ such a person even though it should cost considerable to get him."

The outcome of this has been the insertion of an advertisement in the Trenton newspapers requesting sealed proposals for plans for sewerage of the city and estimates of the cost of construction of the same. This is a most extraordinary way of doing business. The preparation of plans for sewerage for a city like Trenton requires skill and experience. The committee ask professional men to give them the benefit of their experience and to spend their time in preparing plans, which they expressly reserve the right to reject, without compensation and without reason assigned. Who is to decide as to the merit of the plans?

The Chairman of the Sanitary Committee is not an expert, nor are any of its members. We wonder whether any of those gentlemen, when they have sickness in their families, advertise for proposals for a plan of curing the invalid, or if they are sued by an adversary advertise for proposals for a scheme of defense of the case. They might as well do so, and the results would be as effective as will their effort to get reputable and experienced engineers to offer them sewerage plans for their city.—*Sanitary Engineer.*

THE TREMONT METER.

CERTIFICATE OF ORGANIZATION OF TREMONT METER COMPANY.

STATE OF MAINE.

The undersigned, officers of a corporation, organized at Portland, Maine, at a meeting of the signers of the articles of agreement therefor, duly called and held at the office of Fletcher & Company, in the City of Portland, Maine, on the Sixteenth day of May, A. D. 1883, hereby certify as follows:

The name of said corporation is "The Tremont Meter Company."

The purposes of said corporation are to make, use and sell, and to license others to make, use and sell, Liquid Meters or parts thereof.

The amount of capital stock is five hundred thousand ($500,000) dollars.

The amount of capital stock already paid in is seven hundred and fifty ($750) dollars.

The par value of the shares is twenty-five ($25) dollars.

The names and residences of the owners of said shares are as follows:

Names.	Residence.	No. of Shares.
Frederick Curtis	Boston, Mass	Ten
Francis H. Raymond	Boston, Mass	Ten
John Fottler, Jr.	Boston, Mass	Ten

Said corporation is located at Portland, in the County of Cumberland. The number of Directors is three, and their names are Frederick Curtis, Francis H. Raymond and John Fottler, Jr. The undersigned, Frederick Curtis, is President; the undersigned, Francis H. Raymond, is Treasurer; and the undersigned, Frederick Curtis, Francis H. Raymond and John Fottler, Jr., are all the Directors of said corporation.

Witness our hands this sixteenth day of May, A. D. 1883.

FREDERICK CURTIS, President.
FRANCIS H. RAYMOND, Treasurer.
JOHN FOTTLER, JR., }
FRANCIS H. RAYMOND, } Directors.
FREDERICK CURTIS, }

COMMONWEALTH OF MASSACHUSETTS.

COUNTY OF SUFFOLK, CITY OF BOSTON—ss:

On this twenty-second day of May, A. D. 1883, then personally appeared Frederick Curtis, Francis H. Raymond and John Fottler, Jr., and severally made oath to the foregoing certificate, that the same is true.

In witness whereof, I have hereunto set my hand and official seal, at said Boston, as I am a Commissioner of the State of Maine, residing in Boston, duly commissioned and qualified to take affidavits, etc., for said State.

[L. S.] SAMUEL JENNISON,
Commissioner for Maine in Boston and Justice of the Peace.

STATE OF MAINE.

ATTORNEY-GENERAL'S OFFICE, May 26, 1883.

Having examined the foregoing certificate, I certify that the same is properly drawn and signed conformable to the constitution and laws of the State.

HENRY B. CLEAVES.

Since this act of organization was secured Hon. Moody Merril has become connected with the company.

Of the responsibility of the Tremont Water Meter Company to carry out their contract there cannot be any doubt, especially as the parties are well known, but it is somewhat singular that a company should be organized in another State on the 16th of May for manufacturing meters or procuring the manufacture of meters, and strike such a streak of luck on the 18th of the following August. This can only be accounted for by the supposition that this new meter is far superior to any meter yet introduced, and for aught we know to the contrary it may be. The meter spoken of as the Tremont meter has a singular history, and one worth recording, as it illustrates how a valuable invention lies dormant, its merits unrecognized and its capabilities unacknowledged, until by a happy turn in affairs it comes to the surface and becomes the champion meter, distancing old and tried competitors, and proving itself, if the tests applied are considered satisfactory, the one thing long needed to economize the use of water.

Some twelve years ago a party in this city was interested in a meter, the model of which he carried to a worker in metals to have produced so that it could be thoroughly tested. The job was undertaken, and a very skillful workman by the name of Sweeny was given the work. As he progressed he became impressed with the importance of water meters, and not only thought over their construction, but studied into their uses. He was never quite satisfied with the model before him, and this spirit of dissatisfaction took such strong possession of him that he finally conceived a new principle for the construction of a water meter. Like all enthusiastic inventors, he gave his whole mind during his leisure hours to the thought, and when he was satisfied that he was on the right track he explained his purpose to his employers. They consulted with the party who owned the patent right to the meter which they were producing, and the impression made upon him was so strong that he abandoned his design and furnished the means for Sweeny to carry out his invention, the parties to be interested pecuniarily, should the meter prove a success, being the promotor, the machinists and the inventor. It was many months before the new or Sweeny meter was perfected, and then it gave every promise of success. Sweeny died before anything was realized, and the great fire of 1872 swept away the shop, plans and drawings of this meter. It was tested in New York and in Washington, we think, but nothing was done to give vitality to the meter, with the exception that the drawings were reproduced, and another meter was made. Some years after the fire a meter company was started in Boston, and upon examination of it it was found that it was upon the same principle mainly as the Sweeny meter, though inferior in some respects. A suit was commenced for the infringement of the patent, but the company having passed out of existence, the suit was abandoned. This in brief is the history, we believe, of the so-called Tremont meter.

We have no disposition to underrate its merits, for the family of the inventor still hold, we believe, an interest in the invention. But we urge upon the consideration of the Water Board the importance of giving to this and all other meters a fuller and more open trial than has yet been given. We have in Boston a School of Technology. Let the test be made there. Let Mr. Cutts be one of the judges. Before adopting any meter, this is due to the public, whose money is at stake. Should the Tremont or Sweeny meter prove to be the best, we shall record the fact with great pleasure.—*Boston Journal, 6th.*

BRIDGE OVER THE YAZOO RIVER, FOR THE LOUISVILLE, NEW ORLEANS & TEXAS RAILROAD.

The bridge now in process of construction over the Yazoo River, twelve miles north of Vicksburg, on the line of the new road being built from New Orleans to Memphis, has, in the design of its piers, some features which it is believed will justify a description.

The Yazoo River flows into the Mississippi, a few miles above Vicksburg. At the point where the bridge in question is being built, that is, twenty miles above its mouth, it has a depth at ordinary low water of 31 ft. and is subject to a rise of 50 ft.; being so near the Mississippi the height of water at the bridge is of course dependent in a great measure upon the condition of the larger stream. This circumstance makes the current in the Yazoo very capricious, it being sometimes very strong (when the Mississippi is low and the Yazoo high); at other times it is scarcely perceptible or even has an up-stream tendency. The period of low water begins when the lower Mississippi subsides after the summer freshets; and, with the exception of possible local rises, the river remains comparatively low from late in the summer until about Christmas, occasionally until later.

In the valley of the lower Yazoo the prevalence of malaria makes it impracticable to execute any work until the excessive heat and sickness of summer are over. Thus the bridge building is by fever and flood hemmed into a period of but three or four months in the year during which work can be done. Added to this is the disadvantage of having to bring from the North men and machinery, and to depend upon the common labor of a set of fever stricken natives who, however well they may possibly mean, have anything but a proper conception of time and the value of promises. So much for the country.

At the site of this bridge, the banks and bottom of the Yazoo are made up of the regulation Mississippi River deposit, with, perhaps, a little more clay than is usually found on the bottom of the larger river. There were also occasional streaks of gravel met with in making the borings. No bed rock was found. This bottom is subject to scour, but to what extent could not be ascertained, as there were no existing bridge piers in the neighborhood to study.

The great depth of water at a flood stage, 81 ft., with occasional heavy drift flows and current, rendered a strong and hence heavy pier necessary. And as the piers would be necessarily expensive it was advisable to reduce the number to a minimum and use long spans. Hence with heavy piers and weighty superstructures, both indispensable conditions, the foundation had to support a great weight.

Pneumatic caissons would have been very heavy, and were impracticable, because it was doubtful if they could be sunk to a depth where the material would have had a sufficient bearing capacity. Pneumatic cylinders were open to the same objection, though in a less degree, and their great height would have been objectionable, though not without precedent. But aside from these objections another kind of pier seemed better and much cheaper. The engineers consulted (Wm. Sooy Smith & Son, of Chicago), after a careful personal examination of the site, recommended the following plan, which is a combination of two well-known methods of building foundations, but so far as the writer knows never before employed. It seemed to satisfy all the conditions of the case at a minimum cost, for all the material, except the cement, was afforded in abundance at the bridge site.

The width of the river was about 900 ft., and it was decided to make two fixed spans of 302 ft. each, and a draw of 275 ft., total length; thus requiring two abutment piers, a pivot and two other stream piers. The three piers in the stream were to be built as follows:

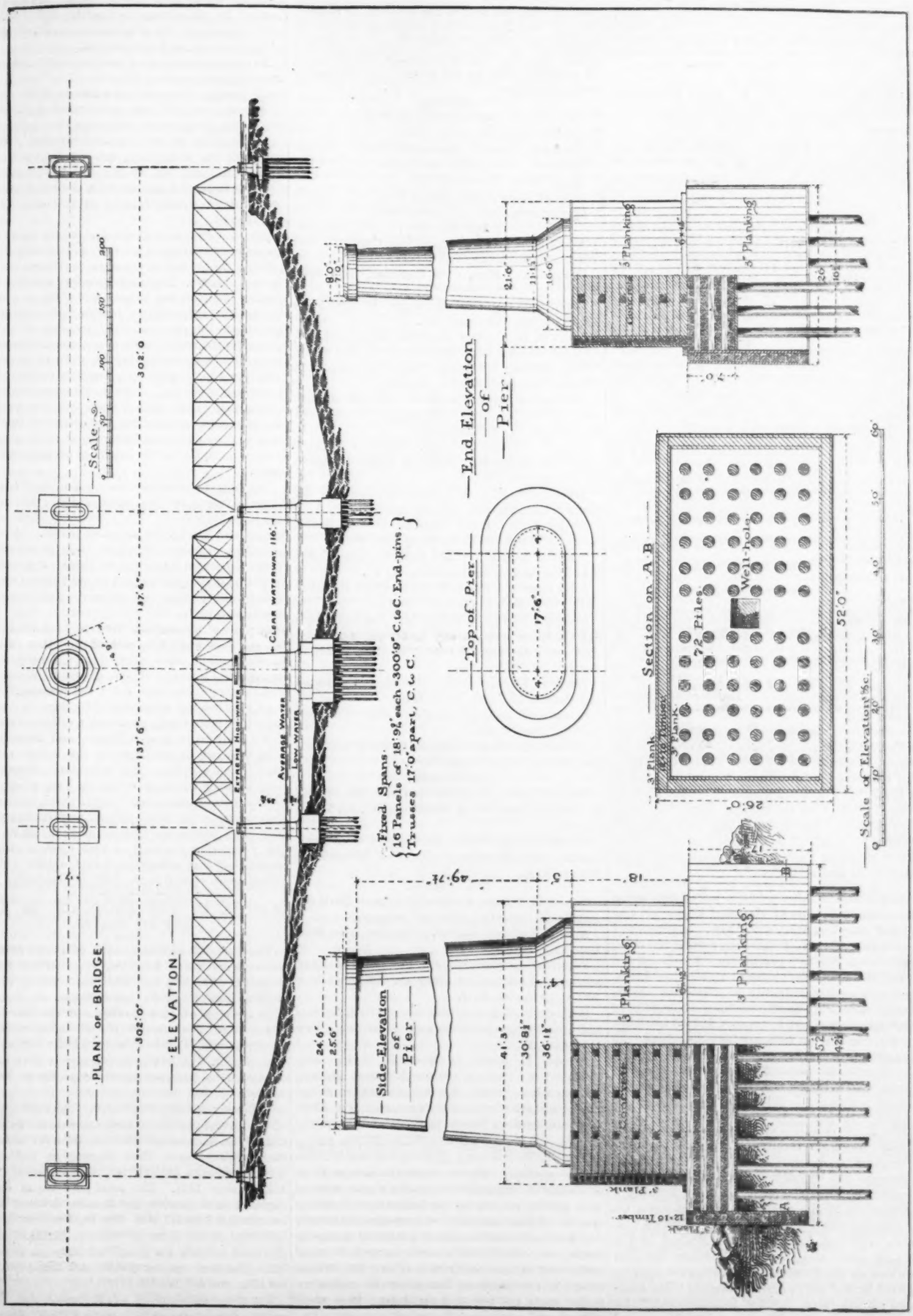
Large pine or cypress piles were to be driven—100 for the pivot and 72 for each of the other two piers—to a depth of 30 or 40 ft. into the bottom. Pneumatic caissons were then to be built, floated over the piles (previously sawed off sufficiently low to permit this) and sunk until the top of the air chamber of the caissons should be level with the bottom of the river. At this level the piles were to be sawed off even and the caisson settled to a bearing upon them. The roofs of the caissons were to be of solid timber, 7 ft. thick. Surmounting the roof, in the pivot pier, and in that for one of the other two which was in the deepest water, was to be a crib-work, built *cob-house* fashion dividing the space above the roof and up to a point 2 ft. below low water mark into compartments 5 ft. square, which were to be filled with concrete. From this point up, and in the case of the piers in shallower water directly from the roof up, the piers were to be monoliths of concrete, built by laying the concrete in a temporary wooden shell of the proper shape. Concrete possessed a great advantage in point of cost over masonry, there being no dimension stone available, while there was an abundance of excellent sand and stone for concrete close at hand.

The object of using pneumatic caissons was twofold—it afforded a means of sawing off the piles at the river bottom, and obtaining a perfect bearing upon them; and the sides of the caissons were to form a kind of sheathing or protection to the piles in case of scour. This latter, however, was to be prevented by mattresses and rip-rap about the piers.

The abutments were to be also of concrete, one of them to rest on piles. As navigation on the river is very limited, no protection for the draw has been planned, though one may be built eventually.

During the short working period of last year material was accumulated and a large portion of the work done before the high water caused its suspension. All but a few of the piles were driven for all the piers, one of the caissons was sunk and the concrete over it commenced; both of the other caissons were built, the two abutments started and considerable other work done. With fair luck the work is expected to be completed, and the superstructure, for which Clarke, Reeves & Co. have the contract, nearly erected during the coming working season.

The chief engineer of this work is Capt. John A. Grant. Wm. Sooy Smith & Son, of Chicago, are the consulting engineers.



BRIDGE OVER THE YAZOO RIVER.

ENGINEERING NEWS
AND
AMERICAN CONTRACT JOURNAL.
Tribune Building, New York City.

The Engineering News Publishing Company, Proprietor.

Published Every Saturday.

CONDUCTED BY
GEO. H. FROST and D. McN. STAUFFER.

TERMS OF SUBSCRIPTION:
$4.00.....PER YEAR TO U. S. AND CANADA.
$5.00 ..... " " " FOREIGN COUNTRIES.
Make all drafts and cheques payable to ENGINEERING NEW PUBLISHING Co. Postal Money Orders, for convenience, may be made payable to GEO. H. FROST.

NOTICES OF MEETINGS.

AMERICAN INSTITUTE OF MINING ENGINEERS.

The Autumn meeting of the Institute will be held in Troy, N. Y., during the second week in October. This meeting will be mainly devoted to the reading and discussion of papers.

Members who wish their papers fully discussed at the meeting can have them printed and circulated in advance, if they are sent to the Secretary early in September.

THOMAS M. DROWN, Secretary.
R. W. HUNT, President, Troy, N. Y.

NEW ENGLAND WATER-WORKS ASSOCIATION, 1883.

The Fall meeting of this organization will be held at Pawtucket, R. I., Wednesday, September 19, in accordance with the decision at the last Annual Meeting whereby the invitation of Edwin Darling, Esq., was accepted.

All those proposing to attend, are reminded of the importance of promptly reporting at 9.15 a. m., at the *Music Hall Building*, at which place and time the visitors will be conveyed in carriages to the different points of interest, connected with the Pawtucket Water-Works. Upon return, an exhibition of the Pawtucket Fire Department will be made by Chief Engineer Collyer, after which, a collation will be served. The party will then proceed by steamer down the Pawtucket and Providence rivers to a point to be hereafter decided upon, where an old-fashioned Rhode Island clambake will be served, returning in time to connect with the late afternoon trains.

It is hoped that a large representation of the managers of the different Water Departments of New England, will be present, and all those eligible, who have not already joined the Association, are cordially invited to do so.

Members of Water Boards are heartily welcome at any meeting of the Association.

All those expecting to attend, are requested to promptly notify Edwin Darling, Pawtucket, R. I., that ample provision may be made for all.

R. C. P. COGGESHALL, Secretary.
NEW BEDFORD, Mass., Sept. 1, 1883.

Officers, 1883-4.

President—Frank E. Hall, Worcester, Mass.
Vice-Presidents—Charles K. Walker, Manchester, N. H.; Horace G. Holden, Lowell, Mass.; Edwin Darling, Pawtucket, R. I.; Nathaniel I. Jordan, Auburn, Me.; Sherman E. Granniss, New Haven, Conn.
Secretary—Robert C. P. Coggeshall, New Bedford, Mass.
Treasurer—Edwin Darling, Pawtucket, R. I.
Executive Committee—The above named officers with Henry W. Rogers, Lawrence, Mass.; Thomas C. Lovell, Fitchburgh, Mass.; William R. Billings, Taunton, Mass.
Finance Committee—James H. Hathaway, New Bedford, Mass.; J. Stewart Brown, Worcester, Mass.; Albert S. Glover, Newton, Mass.

FRANKLIN INSTITUTE JOURNAL.—The September number contains the following papers: "Standard Reamers for Locomotive Work," by Coleman Sellers; "The Screw Propeller," by Jas. N. Warrington; "Note on Centrifugal Force," by Robt. H. Thurston; "Prevention of Dust Explosions and Fires in Malt Mills," by C. John Hexamer; "The Green Mountain Railway;" "Improvement in Apparatus for Testing Boilers."

THE *Moniteur Belge* publishes an official decree instituting a diploma of electrical engineer. One year of complementary study has to be given, and a certain programme followed by mining and other engineers during two years more. The theory and practice of electricity, applied mechanics, industrial architecture, designing machines, laboratory work, the drawing up of reports on application of electricity to industrial purposes, and a knowledge of the English or German language form the main points of this course.

THE ENGINEERS' CLUB, OF PHILADELPHIA.

No. 4, of Vol. III. of the Proceedings of this Society has been received. The contents are as follows: The Annual Address of the retiring President, Mr. Rudolph Hering, with a striking likeness, a phototype of Mr. Hering forming a frontispiece to the number. "New Methods for Estimating the Contents of Highly Plicated Coal Beds," by Chas. A. Ashburner; "Method of Receiving Bids and Letting Contracts for Iron Bridges, on the Pittsburg, McKeesport & Youghiogheny R. R.," by P. F. Brendlinger; "The Delaware Breakwater Harbor Improvement," by James M. Stewart; "The Steamship Mariposa," by Horace See.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

The first meeting of the society after the summer vacation was held at the house of the Society, No. 127 East Twenty-third street, on Wednesday evening last. Vice-President Paine occupied the chair; Secretary Bogart and a fair representation of members were in attendance. The following were elected:

FELLOWS.

John Lawler, Prairie du Chien, Wis.
Albert Conro, Milwaukee, Wis.
Alexander Mitchell, Milwaukee Wis.
Charles L. Colby, Milwaukee, Wis.
D. L. Wells, Milwaukee, Wis.
Edward P. Allis, Milwaukee, Wis.
Francisco de Garay, City of Mexico.

FOR MEMBERS:

Andrew Bell, Resident Engineer, Carillon Canal Works, Carillon, Canada.

Henry Isaac Bliss, Civil Engineer, La Crosse, Wis.

William Warren Card, Secretary Westinghouse Air Brake Co., Pittsburgh, Pa.

Frank C. Doran, City Engineer, Richmond, Ind.

George Downe, Supt. Motive Power New South Wales Government Steam Tramways, Randrick, Sydney, New South Wales, Australia.

Christopher Lawrence Gates, (Elected Junior. Dec. 4, 1878), Engineer Milwaukee Bridge and Iron Works, Milwaukee, Wis.

William Henry Jennings, Engineer Hocking Valley Div. Columbus, Hocking Valley & Toledo Ry., Columbus, Ohio.

Albon Platt Man, Jr., First Ass't Engineer St. Louis & San Francisco Ry., St. Louis, Mo.

Daniel McCool, Chief Engineer Detroit, Mackinaw and Marquette R. R., Marquette, Mich.

Wallace McGrath, Chief Engineer Ohio Valley Construction Co., Parkersburg, W. Va.

John Lawrence Power O'Hanly, Chief Engineer Ontario Pacific Ry., Ottawa, Canada.

George Washington Polk, Chief Assistant Engineer Mexican and Pacific Extension, Galveston, Harrisburg and San Antonio R. R., San Antonio, Texas.

Watson Wellman Rich, Chief Engineer Minnesota Central R. R., St. Paul, Minn.

Leonard W. Rundlett, Engineer Water Commission, St. Paul, Minn.

Edward Higginson Williams, Baldwin Locomotive Works, Philadelphia, Pa.

ASSOCIATES.

Joseph P. Card, President St. Louis Iron Mining Co. and St. Louis Wood Preserving Co., St. Louis, Mo.

George Fillmore Swain, Professor of Civil Engineering, Massachusetts Institute of Technology, Boston, Mass.

FOR JUNIORS.

George B. Francis, Assistant Engineer Northern Pacific Terminal Co., Portland, Oregon.

Alfred Williams Trotter, Civil Engineer, New York City, N. Y.

Frederick Newton Willson, Professor of Engineering and Mechanical Drawing, College of New Jersey, Princeton, N. J.

Herbert M. Wilson, Topographer U. S. Geological and Geographical Survey in Arizona, New York City, N. Y.

A paper by James L. Randolph, M. Am. Soc. C. E., "On Vibration or the Effect of Passing Trains on Iron Bridges, Masonry and other Structures," was read by the Secretary, and was afterward discussed by Messrs. Cooper and Emery.

THE RAILROADS OF THE UNITED STATES.

The contents *Poor's Manual*, reviewed in this issue, are suggestive of much thought, and debate as well, concerning the future of the railway system of this country. The roads built within the last three years represent a liability charge in shares, etc., of $70,000 per mile, as against a cash outlay for actual construction of only $30,000 per mile. The inference is, that either the roads were forced upon the public long before they were wanted, and a corresponding sacrifice made by the builders, by giving two dollars in shares for every dollar in cash; or the incorporators in satisfying the public greed for "new securities" gave to the *confiding* subscribers only fifty cents for each good dollar. In either case the resulting evil is equally to be deplored; the original transaction is either unbusiness-like, or it is dishonest.

As contrasting our own method with that pursued is other countries, we notice that Prussia, has lately bought of its previous owners, 12,000 miles of railway, at a cost to the government of $460,000,000, or $36,220 per mile; and pays this debt by a bond bearing 3 per cent. annual interest. We do not think that in our case, the government should own the railroad, but we do think that laws should be made to control this growing evil; and the excellent laws already framed to this end should be enforced.

Corporations are proverbially minus souls, and we may say conscience as well, and as long as the gullible people will buy shares, the shares will be furnished them. Paper and printers' ink are inexpensive articles, and it costs but little to sign a bond. The corporations justify their actions by pointing to the promised rapid increase in valuation after the road is put in operation; the securities will then be worth par; the country traversed will be made wealthier in facilities; all must be benefited in the end. This would undoubtedly be true in many cases did not every new corporation use the same arguments, and often use them to raise the means to parallel a road or roads already more than equal to the handling of all available trade.

The motive of each new corporation is, of course to make money for the incorporators; but some one must furnish the money, and that some one is the general public, the investing public. Men are naturally gamblers, they will "take the chances" when a promise is held out to them of doubling their investment somewhere in the future; and it is of this inclination that the unprincipled schemer takes advantage. The investor seldom looks into the merits of the project; he rarely has the facilities for so doing; the railroad may run to the moon for all he cares or knows; he simply takes on faith the wording of the glowing prospectus, and exchanges his cash for "the chances." He may win, but the enormous shrinkages in valuations that periodically occur tell a different story.

We want many new railroads, and there is a wide field still in our country for honest enterprise in this direction; but something should be done to check the construction of lines where the "construction companies" alone make money at the expense of the simple-minded and trusting public; or to prevent the increase of share capital by the "watering process," so that charges can be maintained that otherwise would appear exhorbitant when viewed in the light of dividends.

MANUAL OF THE RAILROADS OF THE UNITED STATES.

The sixteenth annual number of Poor's Manual is now a volume of 1,055 pages, its covers fairly bursting with data and statistics relating to the railway interests of the United States.

At the close of 1882 the total mileage was 113,329 miles of this amount 107,158 miles were in operation, and 11,591 miles were built within the year named. There was an increase in share capital issued by the respective companies of $385,254,585 over 1881, the total amount of share capital now footing up to $3,456,078,196. The funded debt of the several companies now amounts to $3,184,415,201, an increase of $352,554,496 over that of the previous year. Their floating or unfunded debt amounts to $255,170,962, an increase of $42,404,965 over 1881. The total increase of share capital and of funded and floating debts of 1882 over 1881 is $780,213,776. The total amount of all liabilities at the close of 1882 was $6,895,664,359. The total per mile for completed mileage is $61,342. This is as against $59,985 for 1881; $58,949 for 1880, and $57,730 for 1879.

The gross earnings of all the roads for their several fiscal years of 1882 were $770,356,716, an increase from the previous year of $67,066,511.

Of the gross receipts, $202,140,775 were received from passengers, $506,367,247 from freight, and $61,848,734 from miscellaneous sources. The net earnings for the year were $310,682,877, an increase of $24,929,109 from the previous year. The amount of interest paid was $149,295,380, an increase of $20,708,078 from the previous year. The amount of dividends paid was $102,031,434, an increase of $9,687,244 from the previous year. The percentage in 1882 of gross earnings to investment was 11.2 per cent.; in 1881, 11.5; in 1880, 11.4; in 1879, 10.8. The percentage of net earnings to investment in 1882 was 4.5 per cent.; in 1881, 4.7; in 1880, 5.1, and in 1879, 4.4 per cent. The earnings per mile of all the railroads operated for 1882 were, gross, $7,188, net, $2,899; in 1881, gross, $7,527; net, $3,040; in 1880, gross, $7,435; net, $3,293; in 1879, gross, $6,652; net, $2,761.

A statement is given by Groups of States showing the length of line owned, share capital, funded and floating debts, gross and net earnings, etc. It shows that since 1879 28,019 miles of railroad have been opened in the U. S. And with an increase of 1868 miles of length of "line owned" over 1879, in the Middle Group of States, the funded debt has been increased from $737,251,285 in 1879, to $825,-554,524 in 1882; and the floating debt from $42,-892,268 to $105,889,369 in the two periods named. The gross earnings in the same group were $181,-614,614 in 1879, and $232,450,765 in 1882; the net earnings were $74,546,975 for the first named year, and $96,330,189 for 1882.

The statement further shows that for the three years ending Dec. 1, 1882, the increase in share capital and indebtedness of the railroad companies was $2,023,646,842 equivalent to an average cost per mile, of the road built within the period, of $70,000, in round numbers; while the cash cost of the railroads per mile constructed in these three years was probably not more than $30,000. This difference of $40,000 per mile represents increase of liabilities over cash outlay; in other words, "watered stock."

The *Manual* remarks that railroad building in this country seems to proceed in great waves, and comments as follows upon the present tendency "to extend":

No enterprise is so seductive as a railroad for the influence it exerts, the power it gives, and the hope of gain it offers. Every community, no matter how well supplied, eagerly welcomes a new line, for the money its cost brings it, and the promise it offers of lower rates of transportation. When there has been a considerable pause in the construction of railroads, and the traffic of old lines, which, without rivals, keeps pace with the progress of the country, their success is predicated of every new line, wherever situated, no matter how wanting in real merit it may be. In a highly excited state of the public mind the promoters of new enterprises have, for a time, everything their own way; for the argument on the other side can only be presented by the result itself. There never was a period in our history in which, in the construction and consolidation of railroads, the good sense of our people was so thoroughly at fault as in the period from 1879 up to and including 1882. There can be no doubt that the country is vastly richer and stronger than it was in 1873, and that there is no reason to apprehend the terrible disasters that followed that year; but confidence in our vast strength has probably led to excesses wholly disproportionate to our needs or means.

It concludes by expressing the belief that the building of new roads will proceed uninterruptedly until we have one mile of railroad for each ten miles of area, or a total of 300,000 miles of line.

The number of passengers transported in 1882, on the railroads of the New England group of States, having a population of 3,990,529, was 65,-220,934—a number 16.3 times greater than its whole population. The number transported in Massachusetts was 48,063,639, a number greater than for any other State. The number transported in the Middle group of States having a population of 12,196,876, was 205,844,626, or deducting 86,161,029 carried on the New York City Elevated Railroad, 119,683,597—a number very nearly equaling ten times its population. The number transported in the Southern group of States having a population of 12,255,910, was 10,875,511, a number 1,379,399 *less* than the population of this group. The number transported on the railroads of the Western and Southwestern group having a population 20,132,325, was 82,940,331—a number 4.1 times greater than its population; the low average for this group arising from embracing in it the Southwestern States. The number transported on the Pacific group having a population of 1,393,817, was 10,510,410—a number 7.5 times greater than its population. The total number transported on all the railroads of the United States the past year, not including the New York Elevated roads, was 289,190,783—a number equaling very nearly six times the total population, 50,442,066 of the United States in 1880.

The number of passengers moved one mile in the New England group was 1,107,045,086, at a charge of 2.1 cents per mile; in the Middle States group 2,356,226,676, at a charge of 2.3 cents per mile; in the Southern group 559,577,836, at a charge of 2.6 cents per mile; in the Western group 2,708,-268,037, at a charge of 3.2 cents per mile; in the Pacific group 351,942,279, at a charge of 3.1 cents per mile. The total movement on all the roads equaled 6,834,048,765 persons moved one mile, at a charge of 2.86 cents per passenger per mile.

The movement of freight varied very much with the locality. In the New England States it averaged 7 tons per head of population; in the Middle group of States it was 13.6 tons per head; in Pennsylvania alone 23.4 tons; in the Southern States it was only 1.56 tons per head of population; and in the Western States it equaled the New England average of 7 tons. In the Pacific group it was 4 tons per head. The total amount of freight moved on all the railroads of the United States in 1882 was 360,490,375 tons, an average of 7 tons per head of total population. The freight charges were as follows in the several groups of States: In New England, 1.7 cents per ton per mile; in the middle group, 1 cent; in the Southern States, 1.8 cents; in the Western States, 1.2 cents; and in the Pacific group, 3.1 cents per ton per mile. The total movement of freight on all the railroads of the United States for 1882 equaled 39,302,209,249 tons moved one mile at an average charge of 1.2 cents per ton per mile. The total value of this freight cannot be determined with sufficient accuracy, but it is estimated at $15,000,000,000 or $300 per head of the population of the country.

The *Manual* is issued by H. V. & H. W. Poor, 70 Wall street, New York; price, $5.

THE WASTAGE OF WATER.

In continuation of some remarks made by us several weeks ago, we add the following, principally from a paper upon this subject written by Thos. J. Bell, the Asst. Supt. of the Cincinnati Water-Works, and the inventor of the Bell Waterphone, now so usefully applied in the detection of waste:

Mr. Bell truthfully remarks that the consumers of water have never learned its true value, and fail to realize that by their individual negligence, they endanger the water supply and jeopardize property by direct interference with the work of the Fire Department. He illustrates by the case of the middle service of the city of Cincinnati, in which the cross-sections of the leading mains give a total of 2,630 sq. in., while the service mains or vents to the distribution, have a cross-section of 11,600 sq. in., and the hydraulic elevators, alone, an additional section of 2,700 sq. in. These facts render it impossible, during the day, when the water is most in use, to maintain the static or reservoir head; while at night, when but comparatively little water is used, the return to the static head causes impact or a water-ram, from the accumulation of compressed air, which finally results in the bursting of pipes or in leaking joints. The two mains, which feed this system, also supply approximately 109,000 hydrants and faucets of various kinds, and about 10,000 water-closets. A small leak at a faucet may waste ten to fifty gallons of water per day; while a closet, if left continuously running, will waste 15,000 gallons in 24 hours. Thus it will be seen that in the case of the city mentioned twenty-five per cent. of the water-closets *can* run away more water than the combined capacity of the pumping-plant of the city.

This habit of waste has grown to such a degree that the per capita rate found sufficient forty years ago must now be doubled; and notwithstanding this modern increase in supply per head, a few years' use generally proves it inadequate to meet the demand. Thus, in 1872, St. Louis constructed an entirely new system of water-supply, planned by one of the ablest of our hydraulic engineers, and after the most minute study of the future requirements. The original design provided 44 gallons per day per head, but after the lapse of only ten years it is found that the average consumption, per capita, has increased to 75 gallons, a quantity far exceeding the safe capacity of the present works, and a further expenditure of money is in order to increase the supply.

The greater the consumption of water, or rather quantity pumped, the more difficult or impossible it becomes to filter the required amount. The city of London, with 92 acres of filter-beds, filters two-thirds of the water used; but this is made possible by limiting the consumption strictly to legitimate uses. The daily per capita rate is 40 U. S. gallons, the same that it was in 1849.

Mr. Bell gives a table showing the increase of the per capita consumption in five American cities, and ascribes this increase directly to the wasteful habits of consumers.

Boston, per capita rate in 1850—30 gallons; in 1881—92 gallons.
Brooklyn, per capita rate in 1866—17 gallons; in 1880—54 gallons.
Chicago, per capita rate in 1867—43 gallons; in 1880—114 gallons.
New York, per capita rate in 1867—62 gallons; in 1876—100 gallons.
Philadelphia, per capita rate in 1867—56 gallons; in 1880—67 gallons.
Cincinnati, per capita rate in 1845—21 gallons; in 1881—87 gallons.

In this last-named city, Mr. Americus Warden while Engineer of the Department in 1875, made some careful observations regarding the quantity of water wasted. He found the loss to be 1,250,000 gallons between 12 midnight and 4 a. m., or at the rate of 283,000 gallons per hour, and taking into consideration the general carelessness of consumers during the day, he estimated the total waste at about 50 per cent. of the total daily pumpage. Mr. Warden, in 1875, placed the financial loss due this waste at $29,000 per annum; and Mr. Bell puts it, for 1881, at about $42,000, based on the same estimate of 50 per cent. of waste. The engineers of Chicago and St. Louis use the same percentage in estimating the loss from waste in those cities.

Speaking of the constant demands upon the public purse for the construction of new machinery, which render insignificant the financial loss as given above, Mr. A. G. Moore, Superintendent of the Cincinnati Water-Works for 1880, says: "The annual loss to the works by abuse in water privileges, if reduced to a revenue, would be startling; but far more important than this is the dangerous condition the works are placed in by overtaxing the pumps, and the necessity of constantly providing additional engines to meet the necessary demands for water." The city in question has expended since 1863 three millions of dollars for the extension of her works; this outlay is almost wholly due to wastage in water, and the city is no better off to-day than it was twenty years ago, when its consumption was only 6,000,000 gallons per day.

Cincinnati has now a population of about 256,000, and if the per capita rate of cities in England were taken as a standard, the supply of 1863 would be sufficient for all present legitimate demands, as will be seen from the following table:

	Population.	*Daily consumption.*	*Per capita consumption.*
Sheffield.....	300,000	6,500,000 U. S. Gals.	21.6 gallons.
Manchester..	900,000	21,600,000 " "	24. "
Liverpool....	700,000	19,000,000 " "	27. "
Birmingham.	500,000	14,000,000 " "	28. "
London.....4,000,000		156,000,000 " "	39. "

Following the American practice of abuse in

London, the demand would be nearly 1,000,000,000 gallons daily—a quantity hardly obtainable from all the rivers, wells and springs within a reasonable distance of the city. The summer flow of the Thames does not exceed 300,000,000 gallons daily, at the pumping stations.

In a list of seventeen of the largest American cities the consumption per head ranges from 176 U. S. gallons for Washington to 31 gallons at Providence, where meters are used; omitting the last named city, for the remaining sixteen we have an average consumption of 93.6 gallons per head; and for the first six cities named, viz., Washington, Detroit, Jersey City, Buffalo, Milwaukee and Pittsburgh, the average is 126.6 U. S. gallons per head. The same list, for thirteen principal English cities, including London, gives an average of only 37.1 U. S. gallons per head as the rate of consumption.

The author ascribes this great difference in the amounts of water used in America and Great Britain to the following causes as ruling in the latter country:

1. A diligent and business-like attention given to the water supply, and a prompt and hearty encouragement of all improvements which will prevent waste.

2. To the methods of limited and intermittent supply adopted.

3. To stringent laws governing water privileges and connections, backed by parliamentary power.

4. Plumbers are required to take out licenses, and their work is rigidly inspected and tested.

5. Officers are selected for their special qualifications, and retained for efficiency, integrity and attention to their work.

6. There is a constant house-to-house inspection of water fittings.

7. There is a guarded method of supply, including official approval of plumbing devices, so as to avoid the constant flow of water, especially in closets.

In another table is given by Mr. Bell, the quantity per head of water consumed in several different classes of society, all quantities deduced from actual meter measurements. In the more genteel "flats," renting for from $15 to $40 per month (in Cincinnati), the per capita rate ranged from 27 to 55 U. S. gallons; while in the tenement houses and rooms, renting at $2 to $5 per month, the demand in the tenement house was only 5.8 U. S. gallons per head, and ranged from that amount to 10 U. S. gallons for others of a similar character.

The means now employed for detecting waste and its prevention, among various water-works in America, are classified are follows:

1. House-to-house or day inspection.

2. The introduction of meters, the most reliable of all methods, and in the use of which the cities of Providence, R. I., and Fall River, Mass., are the only cities having what may be called a meter system.

3. Licensing and regulating plumbers, and the inspection and stamping of their work and material. These important regulations are not enforced in this country; but in Great Britain are faithfully observed, and are regarded there as the main cause of success in the prevention of waste.

4. The Deacon system. This consists of the placing of a meter on the main water-pipe to a certain district, which records automatically the approximate flow of water at various times during the day and night. The object of this record is to locate wasteful districts. This system was first introduced in Liverpool, by its inventor, George F. Deacon, C. E., and is in successful operation there. Under an intermittent supply of 9½ hours duration per day, the average consumption was about 35 gallons per head per day, and when the constant service was turned on experimentally, the consumption rose to over 44½ gallons per head. An unrestricted constant service is now given with an average consumption of 28 gallons per day for all purposes, of which 18 gallons are required for domestic use, and 10 gallons for manufacturing and other business purposes.

5. The Bell waterphone. This device consists of a metallic diaphragm attached to one end of a steel rod, the whole inclosed in a trumpet-like casing of gutta percha. A thread is cut on the lower end of the rod. The principle upon which this simple instrument acts, is the amplification of the wave sounds produced by flowing water. Even the current produced by a mere drip is at once detected. The waterphone is used as follows—service boxes connect with the pipes being supposed to be located in the sidewalk—the inspector having opened the box, inserts his key and catches the head of the service-stop, which he turns partly off to lessen the water opening. He then screws the waterphone into the top of the key, and applies his ear to the diaphragm to detect any sounds produced by the flowing of water through the partly closed stop. If a flow exists, however small, he will readily detect it. If no sound is heard, it is conclusive that there is no waste. If a sound is heard, he turns the stop off entirely, and if it then ceases he records an "inside" flow; that is, on the premises. If the sound continues, it is an "outside" leak; that is, between the stop and the main pipe. When there are no sidewalk stops, as in New York and Boston, a clamp is fixed and sealed upon the service pipe at any accessible point inside the premises, and a wire screwed to this clamp is led to the outside of the house where it ends in a screwed end, fixed to the front wall or side of the steps. This waterphone has been used with great success in several of our cities, notably Cincinnati, where it was first introduced.

PERSONAL.

T. N. BOUTELLE, Civil and Hydraulic Engineer, who has designed and constructed numerous water-works in the Western States, is engineer for the proposed works at Boone, Iowa.

GEORGE W. CONKLING, JR., who shot and killed his brother-in-law in New York, is at present in Colorado. His trial will take place in the early part of October.

EDWIN F. JOHNSON was the first and original chief engineer of the Northern Pacific. Not being of an active age, W. MILNOR ROBERTS was appointed chief engineer in his place. The present chief engineer is General ADNA ANDERSON. He is a native of New York, and began with the New York & New Haven Company some forty years ago. In 1848 he became assistant engineer of surveys on the Mobile & Ohio road. He remained in this capacity until 1850, when he was appointed resident engineer of the Michigan Southern & Northern Indiana road, but a year later returned to the Mobile & Ohio road as locating engineer. From 1852 to 1860 General ANDERSON was identified with transportation interests in the Southern country in the several capacities of resident engineer of the Tennessee & Alabama Railroad in Tennessee, chief engineer of the Central Southern, also of the Edgefield & Kentucky road, of which he became receiver in 1861. At the same time he provided for the defenses of the Tennessee and Cumberland rivers, in the employ of the State. Early in 1862 he came North, and when General HAUPT was appointed to the command of the military railway system, General ANDERSON accepted the position of consulting engineer, in the same service connected with the army of Virginia. In 1863 he was appointed chief engineer of military railways of Virginia, and in 1864, general superintendent and engineer of the same department, where he remained until the close of the war. After leaving the army General ANDERSON was prominently connected with various railroads, and from 1867 to 1870 was consulting engineer and superintendent of the Kansas Pacific. When this road was merged into the Union Pacific he became vice-president and general manager of the Toledo, Wabash & Western road, and during the year 1878–9 was general manager of the Paducah & Elizabethtown road. On Feb. 1 he accepted the appointment of chief engineer of the Northern Pacific.

HERMAN HAUPT, general manager N. P. R. R., was born in Philadelphia in 1817, and entered West Point in 1831. In 1835 he entered the employment of a Pennsylvania corporation as civil engineer. He remained in that service until 1836, when he was appointed principal assistant engineer of the state of Pennsylvania, engaged in the location and construction of the Gettysburg Railroad. In 1839, The York & Knightstown Railroad was completed under his direction, and he was appointed as Professor of Civil Engineering and Mathematics in the State University, during his incumbency of which he published his first work on the general theory of bridge construction. In 1847, he was appointed principal assistant engineer of the Pennsylvania Railroad Company. Two years later he accepted the position of superintendent of the same road, and organized and perfected the various departments of construction, traffic, etc. of that line.

He next went to the Southwest, and afterward became chief engineer of the Pennsylvania road. He shortly afterwards undertook the building of the Hoosac Tunnel. In 1862 he was appointed Chief of the Bureau of Military Railways, and was appointed Brigadier General of Volunteers for his services. He was appointed chief engineer of the Shenandoah Valley Railroad in 1874, and was engaged as consulting engineer by various corporations until April, 1881, when he accepted his present position. J. J. ODELL, his assistant, is also a native of Pennsylvania, has been superintendent of construction on Southwestern lines, and served in various managerial capacities.

SIMEON P. FOLSOM is one of the oldest settlers of St. Paul (Minn.). Mr. FOLSOM was born in Lower Canada, 1819, and is consequently 64 years old, which will greatly surprise most of his intimate friends, who presumed him to be a man not much more than 50 years. He studied and practiced law, and then took up the profession of civil engineering. He left his home in 1839, and came to St. Paul in 1847. He early enlisted in the Mexican war, as did EDMUND RICE and M. N. KELLOGG, and also served in the Union army for a term of three years during the war of the rebellion. He was also on the staff of Maj.-Gen. BODFISH, in 1839, ranking as major, and in 1852–3 was clerk in the Legislature. He was also the first city surveyor of St. Paul, in 1854, and has been a resident of St. Paul for 36 years.

THE American Institute of Architects elected THOMAS U. WALTER President, O. P. HATFIELD Treasurer, and G. C. MASON, Jr., Secretary.

MR. W. B. STEARNS died recently at Marblehead Mass. He was president of the Fitchburg Railroad and was nearly 57 years old. He lived in Charlestown for many years, where he began business life as civil engineer. It was in that capacity that he first became connected with the Fitchburg Railroad more than thirty years ago, having been engaged to execute plans at the request of the directors. A few years later he was chosen superintendent of the road. Some seventeen years ago he was elected president. The last important project in which he was interested was the proposed establishment of a consolidated line which it was intended should include the Fitchburg Railroad, the Vermont & Massachusetts, the Troy & Greenfield, the Hoosac Tunnel and either the Troy & Boston or the Boston, Hoosac Tunnel & Western railroads. He leaves a widow and four children.

Mr. OCTAVE CHANUTE, for many years the chief engineer of the New York, Lake Erie & Western Railroad Company, and under whose personal supervision many miles of the main line of the road and the great Bradford viaduct were constructed, has resigned his position. He will retain a position with the company as consulting engineer, though his official title will be assumed by Mr. H. D. BLUNDEN, who has been for several years Mr. CHANUTE'S assistant. Mr. CHANUTE has removed to Kansas City, Mo., and will make that city his home hereafter, resuming his profession as a civil engineer.

WINSLOW UPTON, now with the U. S. Signal

Service at Washington, has been appointed to the Professorship of Astronomy in Brown University, Providence, R. I.

DR. J. W. DAWSON, Principal of McGill University, Montreal, was presented, on the 5th, with an address and $5,000 by citizens on the eve of his departure for Europe, where he will remain a year.

PROF. VARLEY, who was electrician to the Electric International Telegraph Company, which laid the first cable across the Atlantic Ocean, is dead.

GEORGE B. ROBERTS, the President of the Pennsylvania Railroad Company, began as a rodman in the engineer corps, and was soon made assistant engineer in the construction of the Eastern division of the line. Afterward he was engineer in the construction of various lines of railroads through the State, and then returned to the Pennsylvania as an engineer in charge of its branch roads. He soon became Fourth Vice-President, and passed through the different chairs until he became President.

J. N. DUBARRY, the third Vice-President, began in the engineer corps in the construction of the Pittsburgh Division. Upon the completion of this work he was sent to the Western Division of the Pittsburgh, Fort Wayne & Chicago Railroad, to assist in its construction. Upon his return from the West he was made Superintendent of the Northern Central Railroad, and subsequently was promoted to the General Superintendency and Vice-Presidency of that line under the Presidency of Senator CAMERON. After several years' retirement from active railroad work he again entered the service of the company, and was made assistant to the President, which position he filled until his last promotion.

STRICKLAND KNEASS, assistant to the President, is a graduate of the Troy Polytechnic Institute, and was engaged under J. EDGAR THOMSON in the construction of the Middle Division of the Pennsylvania Railroad. He laid out the city of Altoona, and had charge of the construction of the shops and other improvements of the company in the early history of that city. He subsequently retired from the service of the company to become chief engineer and surveyor of the city of Philadelphia. It was under his administration that the Chestnut street bridge was built and other important improvements made in that city. Upon his retirement from public place he was appointed assistant to the president of the Pennsylvania Railroad, which place he has filled since that time.

WILLIAM H. BROWN, the chief engineer of the company, served during the war as Chief of the Construction of Railroads and Bridges for the Army of the Potomac. At the close of the war he entered the service of the Pennsylvania Railroad as assistant engineer in the construction of the Philadelphia & Erie Railroad, and after filling various positions there was transferred to the main line at Altoona. While there he became Engineer of the Middle Division, and when the Sunbury & Lewistown Railroad was purchased by the Pennsylvania Railroad Company Mr. BROWN was made its superintendent. Later on Bedford Division was built. He was made superintendent of that line. Soon thereafter he was transferred to Philadelphia, and made Engineer of Maintenance of Way, and in 1881 was appointed chief engineer of all the lines east of Pittsburgh and Erie. During his term as chief engineer he has built the Susquehanna and Trenton bridges and the Filbert street extension of the elevated railroad, all of which are considered remarkable feats of engineering skill.

O. E. MCCLELLAN, Superintendent of the Middle Division, began as an engineer with the civil engineer corps on the Atlantic & Great Western Railroad while his uncle, GEORGE B. MCCLELLAN, was president of that line. He was afterward engaged in the survey of the Northern Pacific Railroad. He entered the service of the Pennsylvania Railroad as assistant engineer at Altoona. He was afterward in charge of the construction of the Canton Elevator at Baltimore. Soon after the completion of this, he took charge of the Washington street elevator, and, upon the promotion of Mr. PUGH to the general superintendency, was made general agent at Philadelphia, which position he filled until transferred to his present office.

S. M. PREVOST, the General Superintendent of the Pennsylvania Railroad Division, entered the service of the company in 1871 as Assistant Engineer of the Philadelphia Division. He was afterward transferred to the Bedford Division, of which he became superintendent. Then he became Superintendent of the Philadelphia Division, and October 1, 1882, was made General Superintendent of the Pennsylvania Railroad Division, with headquarters at Altoona.

ROBERT NEILSON, the General Superintendent of the Philadelphia and Erie Division, began his railroad career in the engineer's office, under Mr. Cassatt, on the Philadelphia and Erie Railroad. He went to Altoona as Assistant Engineer of the Middle Division, from which place he was promoted to the superintendency of the West Pennsylvania Division, then to the superintendency of the Elmira and Canandaigua Railroad, and then to the Erie.

THEODORE N. ELY, the General Superintendent of Motive Power, is a graduate of a Polytechnic College, and entered the service of the company as a rodman in the engineer corps of the Philadelphia and Erie Railroad. After filling the positions of assistant engineer and superintendent of the Middle Division of the Philadelphia and Erie Road he was transferred to Altoona, where he became Superintendent of Motive Power. Under the reorganization of the company in 1882 he was made General Superintendent of Motive Power and placed in charge of all the rolling stock and shops of the company on the lines east of Pittsburgh and Erie.

SALT LAKE, Utah, Sept. 4.

HARRY FOX, of the firm of HARRY FOX & CO., bridge builders and lumber dealers, of Chicago, died suddenly of apoplexy at the Walker House in this city this morning. Friends have been telegraphed as to the disposition of the body. Mr. Fox came to Chicago twenty-six years ago, and very soon thereafter began operations on the river with a steam dredge. He cleared out the channel, opened a passage through the bar, and contributed to many of the improvements which have made the docks of Chicago. He associated himself with Mr. HOWARD, and the firm continued the business he had begun, and afterward built the bridges at Rush, State, Clark, Lake, Van Buren, Halstead and Kinzie streets, and Chicago and Clybourn avenues. Their work is in other sections of the country as well. He was an earnest man in his work and his friendships. He was companionable and generous. He was born in Westfield, Mass., Sept., 1826, and was married to Miss CHAMBERLAIN, of Newberry, Vt., in 1826, by whom he had two children. Recently he had been connected with the firm of FITZ-SIMONS & CONNELL.

KEEPING FIELD NOTES.

PHILADELPHIA, Sept. 1, 1883.

DEAR SIR: Realizing the need of system in the matter of "keeping field books," I have introduced a chapter on Forms of Record in my proposed work on "The Topographer; His Methods and Instruments," now in press, which I hope will be satisfactory to James K. Barr, as per your issue of Sept. 1. The book will probably be out within the year, and cost a moderate sum for one so fully illustrated. Respectfully, L. M. HAUPT.

PAYING FOR HOWE TRUSS BRIDGE.

ALLIANCE, O., Aug. 29, 1883.

EDITOR ENGINEERING NEWS:

Please state the general practice adopted in paying for Howe truss bridges, especially "whether the contractor is entitled to so much per foot measured only from end block to end block (actual span of bridge) or so much per foot for full length of bottom chord." An early reply will oblige yours, D. T. LUMLEY.

[Personally we have little experience in the erection of wooden bridges, but believe the usual practice is to measure *extreme length* of chord in Howe truss wooden bridges. We would be pleased to hear from some one of wider experience in this field than ourselves.—ED. ENG. NEWS.]

NEWS OF THE WEEK.

THE ENGLISH LAND BUYERS.—After referring to some of the irrigating works of the English corporations, the Kansas City *Times* continues: "Now, about the speculation. Land that can be irrigated is sold at from $8 to $20 per acre. A water privilege of one and one-half foot of water per second is quite sufficient for eighty acres, and is rented at $1.50 to $2.50 per acre per annum, or perpetual use of the water is sold at $10 per eighty acres. The greatest share of the agriculture of Colorado is carried on along these two canals, and they have been of great benefit, and a benefit that must be permanent.

"This is one side of the question. Another is, these companies monopolize all the water. Unless a settler buys land of the company he can get no water. By lowering the upper leads of the streams they have tapped many settlers; farms have been ruined, as their ditches ran dry. No relief could be got from the courts or by the Legislature. The companies were too strong for an isolated farmer. Where the company bought land of the government alternate section must be waste, as no water can be got. It is certainly a monopoly. The Legislature, when the right of way was granted for the canal, could have required the companies to sell water alike to all comers while they had it to sell, but this was not done, and now it is too late."

THE BRIDGE CONTRACTORS on the Chicago, Springfield & St. Louis have men at work on all bridges between Litchfield and Mt. Olive.

A SLIPPERY ROAD.—Grass is so high on the New Orleans & Mississippi Valley road that it interferes with travel, as it is crushed on the rails and makes them slippery.

THE POINT PLEASANT (W. VA.) BRIDGE.—This fine bridge has been delayed in construction by injunctions on the part of property owners. Baird Brothers, of Pittsburgh, are the contractors for the superstructure.

THE HELENA (ARK.) BAR.—A member of the U. S. Engineer Corps has lately examined the bar, and will make a report, and doubtless work will be begun in the summer. It is thought that a contract for repairing the old town levee will be given out by Oct. 1.

BROCKVILLE, WESTPORT & SAULT STE. MARIE R. R.—A firm of New York capitalists have offered to build the road for an assured bonus of $125,000 for the section between Brockville, Ont., and Westport, about 50 miles. At a meeting held recently, Mr. J. F. Wood and Mr. G. F. Fulford, of Brockville, were appointed a committee to engage a civil engineer to make a survey of the road and to take the other necessary steps to procure a charter as soon as practicable. The funds to meet expenses have been provided by the different municipalities interested.

BRIDGE NOTES.—The Pacific Bridge Co., of San Francisco, have taken a contract to build a bridge over the Umatilla River near Pendleton, Oregon.

The Pittsburgh Bridge Works are busy on a number of orders for iron bridges.

The Niagara Bridge Works in Buffalo, N. Y., have just completed a bridge of four spans over the Coosa River in Alabama, for the Georgia Pacific road.

Raymond & Campbell, in Stillwater, Minn., have taken the contract to build a combination truss bridge over the St. Croix River on the Grantsburg Branch of the St. Paul & Duluth road.

CHEYENNE (Wy.) has a sewer contract, but wants to give it to the highest bidder.

THE works at Vicksburg Harbor have been partially discontinued, but have been examined by members of the River Commission, including Generals Comstock and Ferguson.

LAWRENCE (Kan.) is agitating for water-works.

THE CABLE LINE RAILROAD, Kansas City, has been begun. Mr. R. Gilham, on his return from the East, will let out several important contracts.

THE "PEOPLE'S" RAILROAD.—This project continues to receive the rather incredulous attention of the newspapers. We find the following item, however, in the *San Francisco Chronicle* of Aug. 21: "A party of engineers are engaged in surveying and prospecting for a route through Kern County for a narrow-gauge railroad, proposed to be built with a double track from San Francisco to Boston, by the People's Narrow-gauge Railroad Co."

A PERMANENT SURVEY OF THE MILWAUKEE & ST. PAUL'S extension in Dakota has been made twenty-eight miles west of Aberdeen, at which point a town has been located. It is thought the extension will not be continued farther west than there this fall. Should this be the case, another Aberdeen will be the consequence. The surround-

ing country is one of the most fertile districts in Central Dakota, and it extends to the west as far as the Missouri, a distance of seventy miles. Engineer Baker and crew are now hunting a good pass through the hills. As soon as found, the permanent survey will be made almost to the Missouri.

THE surveys for the extension of the Rochester & Pittsburgh Railroad, from Punxsutawney to Pittsburgh, are completed, and the engineers are making the estimates. It is not known yet when the construction work will be commenced, but probably not until late this fall. Two lines have been surveyed, one of which is considerably longer than the other.

THE WABASH SHOPS are to be at Mount Carmel (Ill.). W. A. Stripe, of Peru, and W. V. Hotchkiss, of Lafayette, Ind., Wabash engineers, are in the city making contracts for the building of a round-house, store-room, office, etc., on the company's grounds there. They say that the work must be commenced at once, and that the round-house must be completed by the 1st of October.

THE HUDSON'S BAY SURVEY.—Jukes' survey party has returned to Winnipeg from the preliminary survey of the railway to Hudson Bay, and report a favorable route for construction to Nelson, where there is an excellent harbor. Ice in the bay and straits is not considered a serious obstacle to navigation.

MINNEAPOLIS HAS A COMPETING GAS COMPANY.—In 1872 the Minneapolis City Council granted to the Minneapolis Gas Light Company a franchise for forty years to manufacture and sell gas in this city for illuminating purposes. The Legislature ratified and confirmed the ordinance under this franchise. Last year the City Council granted to Judge Smith of Aurora, Ill., the representative of Mr. Billings of Chicago, a franchise to put in competing gas works, leaving Smith and the existing gas company to settle in the courts the exclusive character of the former franchise.

ARTESIAN WELLS IN DENVER are increasing in number. The stream is generally struck at the depth of 325 feet. The water is very good.

RAILROAD BUILDING IN IOWA.—Diagonal roads are all the rage in Iowa just now. The one from Marshalltown to Des Moines and Nebraska City is being pushed vigorously. Grading is going on along the whole line. Another diagonal road is projected from Winterset southwest to Kansas City. It is to start from Winterset, the end of that branch of the Chicago and Rock Island, and run via Creston. Then there is the La Crosse and Iowa Southwestern, which is to be a part of a continental line from the seaboard to a point on the Missouri River and southwest, which has recently come to the front, with assurance of success.

THE TOPEKA, SALINA AND WESTERN RAILROAD is contracted for by Mr. Peterson, and he is bound to have the road completed to Delhi, in Osborn County (Kan.), by July 1, 1884. The contractors for the grading and mason work from Council Grove to Saline have now about 100 men at work. It is the intention to have this thirty miles completed and in operation within sixty days. If nothing unfavorable occurs, the entire construction force of the road will be operating in Dickinson County before the 1st of November.

AN EXTENSION OF THE SOUTHWESTERN, from Blakely (Ga.) to Columbia (Ala.), is wanted by the people of the latter city, who are trying to raise the money to build it.

BRIDGE BURNED.—The Manitoba Railway Bridge over the Mississippi River at Minneapolis was burned Sept. 4.

THE NORTH ADAMS (MASS.) RESERVOIR.—After two months of surveying in Clarksburg the prudential committee have finally obtained of Prof. Green estimates of a reservoir there. The site, as surveyed, would contain 274 acres and hold 1,250,000,000 gallons of water, sufficient for a town or city of 40,000 inhabitants. The source of the supply is Hudson B ook, which rises near Stamford, Vt., and in Bear Swamp at Clarksburg. The water shed is estimated to cover 11½ square miles, and Prof. Green says the reservoir would be filled by it nearly three times a year. The brook now flows an average of 1,250,000 gallons every 24 hours. The reservoir would include the sites of several large farms and houses, a school-house and a barn. It is probable, however, that the boring system of Edson will first be experimented with.

A ROAD FROM PETERSBURG (PA.) TO WILLIAMSBURGH is spoken of. It would connect with another branch running to Hollidaysburg.

YELLOWSTONE PARK R. R.—It has been found that the railroad survey which is being made across Wyoming to the Yellowstone Park, beginning at Fort Washakie, is contracted for by John R. Bothwell, of New York. It is not known who his backers are, though it is reported that a London syndicate is behind him. It is also said that he is acting in the interest of the Union Pacific or Central Pacific Railway. It is known that the Bothwell party have secured soda lakes, petroleum springs and other large interests in this section. Col. Wallace, of Pennsylvania, is with Mr. Bothwell at Fort Washakie and Dr. Groff is on the road to join them. The country that will be developed by this road is noted for its agricultural grazing land as well as for timber, soda, coal, iron and petroleum.

WISCONSIN RAILROADS.—The annual reports of roads operating in Wisconsin have just been received for year ending June 30. The Prairie du Chien & McGregor is two miles in length, and operates the pontoon across the Mississippi. The capital stock is $100,000. The total income last year was $56,251, the net income $27,552. The Milwaukee, Lake Shore & Western runs 337 miles in Wisconsin. The Chicago & North Western has a mileage of 3,584 in the State.

SOUTHEASTERN RAILWAY.—All prospects of the Southeastern Railway being sold to the syndicate of New York capitalists appear to be at an end for the present, and the floating creditors of the road are likely to be frozen out.

MEXICAN NATIONAL RAILROAD.—SALTILLO, Mexico, Sept. 5.—The first train on the Mexican National Railroad arrived here this evening. The whole town turned out to witness this great event for Saltillo.

FORT SMITH & HOT SPRINGS R. R.—Another new Arkansas railroad project has come into existence. Ex-Governor Rector, G. L. Smith, J. M. Keller, John D. Adams, E. W. Rector, T. F. Londe and McGee Williams, secured a charter for the Fort Smith & Hot Springs Railroad. The proposed road will be ninety-five miles in length. Engineers will be at work surveying the line of road in a few days, and the work will progress rapidly.

THE VISITACION WATER COMPANY is a new corporation in San Francisco.

NEW WATER-WORKS.—Monmouth, Mendota, Galesburg and Jefferson, Ill., are urging upon their citizens the importance of a public water supply.

CONTRACT AWARDED.—Samuel I. Pope & Co., of Chicago, were awarded the contract for heating apparatus for the Cincinnati Custom-House at $128,879.49.

PUBLIC WORKS OF CHICAGO.—From the report of the Commissioner of Public Works of Chicago, it appears that on Dec. 31, 1882, there were 380,924 miles of sewers in the city. There were 28.44 miles of streets paved in 1882. The commissioner urges the general substitution of stone for wooden pavements.

PEOPLE'S RAILWAY COMPANY OF AMERICA.—The *Railway Age* says: "The list of officers attached to the prospectus includes four surgeons. As their services cannot possibly be needed for years by wounded employés or passengers on this still unhatched railroad, it must be that they are provided to attend upon sick subscribers to the stock of the company. That the subscribers will be sick is as certain as the sunrise. And the mischief of it is that when the time of awakening and disgust comes, the victims will believe that they have a grievance against railways and will rail and vote against them, forgetting or failing to see that their own foolish credulity is mainly responsible for the inevitable disappointment and loss."

THE MISSOURI RIVER IMPROVEMENT.—A committee of the Board of Trade of Kansas City lately came to St. Louis to consult Major Suter about an immediate appropriation of $200,000 for the Missouri River at Kansas City to prevent a change of channel, which would leave Kansas City and Wyandotte without a river front.

MORE PARKS FOR NEW YORK.—The Commissioners appointed to select and locate lands for public parks in the Twenty-third and Twenty-fourth wards met on Tuesday, when a great deal of correspondence from European capitals on the subject of public parks was read. A public meeting will be held next week. Probably three parks will be selected. One will be the Van Courtland Park, on the private estate of that name, a magnificent stretch of 800 acres, having a natural lake of sixty acres and well adapted for a parade and pleasure ground; a second, it is likely, will be somewhere on the Bronx River, and a third on the Sound.

TELEGRAPHIC CONSOLIDATION is proposed of the Southern, the Bankers' and Merchants' and the American rapid Telegraph companies.

A SUIT has been begun against the St. Louis Bridge and Tunnel Company for $10,000 by a workman who was injured while in their employment.

MOSCOW (RUSSIA) WATER-WORKS.—The following rather imperfectly worded advertisement appears in a daily paper of New York: The town of Moscow municipality has received some propositions from several persons and companies in purpose of supplying the town with pure, potable water at their risk and cost, and on paying a certain tariff on the increasing quantity from three to ten million vedros per day. The question of this water supply must be finally discussed at the end of the present year, and the municipality requests other persons and companies who would undertake this affair to make their propositions not later than Oct. 1, 1883. All the data and results of studies in possession of the town municipality may be seen in the Town House every day. Persons wishing to make any investigations at their own expense shall have every possible aid and co-operation.

BIDS FOR THE FEDERAL BUILDINGS IN ST. LOUIS.—There were eight bids for the construction of three pavilions for the U. S. Marine Hospital. The names of the bidders and the amounts were as follows: Helm Bros., $31,622; Volke & Talke, $27,525; J. W. Angus and C. T. Wood, of Washington, $39,500; J. M. Marshall, of Washington, $38,740; Eystra & Morrison, $40,947; R. F. Park, $39,884; C. Linnenhohl & Co., $36,450; Daniel Evans & Bros., $33,500.

THE Jackson (Miss.) Court-House and Post-Office bids, for labor and materials, opened Aug. 30, were as follows:

Rees Evans, $26,450, as per specification, five months; $32,280 Berea stone and terra-cotta; $42,514 all stone Berea.

M. A. McGowan, $35,950, as per specification, 10 months; $45,950, all stone, Fossick, Ala.

Kenderdine & Paret, $38,319, nine months.

Belknap and Dumesnil Stone Company, $39,000, as per specification, ten months; $49,225 all stone.

Bowling Green, nine months, $46,825, plain modillion course.

J. N. Marshall, $40,834, as per specification, Fossick, twelve months.

D. J. Macarty, $42,680, as per specification, Oman & Stewart stone, eight months; $54,000 stone, Oman & Stewart, eighteen months; $43,480, as per specification, Berea stone; $62,000 all Berea stone; $43,500, as per specification, Bedford stone; $64,700 all Bedford stone.

H. N. Taylor, $45,915, as per specification, twelve months; $43,715 Jackson, Miss., brick.

THE PORT DEPOSIT BRIDGE over the Susquehanna has now been formally approved by the Board of Public Works.

THREE SURVEYS FOR THE CAPE COD CANAL have now been made, and contractors are ready to begin the work as soon as the route is decided upon.

A MAGNETIC SURVEY OF THE CANADIAN NORTHWEST is to be made. Lieut. Gordon and Mr. Payne, both of the Meteorological service, will leave Toronto shortly.

DECISION IN AN ELECTRICAL CASE.—NEW YORK, Aug. 29.—A decision was rendered by Judge Blatchford to-day in the United States Circuit Court in the action of the Gramme Electrical Co. against the Arnoux & Hochhausen Electrical Co., which was brought to restrain the infringement of letters patent granted to Zenoble Theophile Gramme and Eardley Koms and Charles D. Ivesnois, Oct. 17, 1871, for seven years from that day for an improvement in magneto-electric machines. It was claimed for the defense that the patentee obtained a patent in Austria, Dec. 30, 1871, and that an application was filed in the United States Patent Office Aug. 17, 1880. The Court held that as the Austrian patent expired, at the latest, on Dec. 30, 1880, and before this suit was brought, and continued to exist no longer, there was no ground for the suit, and therefore dismissed the bill.

QUINCY (ILL.) HAS THE ELECTRIC LIGHT. The contract was made with the American Electric Light Company.

THE CITY HALL AT STAUNTON, (ILL).—J. W. Turk, was the successful bidder to erect a City Hall at Staunton, at a cost of $7,250. His competitors were two St. Louis contractors, the lowest of which was $16 above him.

AN IRON BRIDGE will be substituted for wooden on the Iron Mountain Road across South Big River, near Blackwell.

A RAILROAD from Jackson to Cape Girardeau (Mo.) will be graded at once by Wm. Bagnell, contractor.

A HEAVY consignment of rails is expected at Galveston from Europe for the Kansas & Gulf Short Line. Some 20,000 tons in all will arrive.

A PHOSPHORUS preparation is used on Swiss railroad cars, by which means they are visible at night.

AMERICAN BRIDGES IN AUSTRALIA.—A correspondent of the *American Mail and Export Journal* writes from Sydney, New South Wales, that a new railway bridge is about being erected to span the Hawkesbury—one of our magnificent streams. Much agitation has risen as to whether the work should be done in the colony. Opinions are divided, but the preponderance points to England or America to supply the superstructure. Experience has shown in this country that when iron-masters enter into heavy contracts with the government, to be completed within a given time,

strikes of months' duration followed. Then, one of the leading engineers did not hesitate to say that there was not skilled labor in the colony to complete the work, and in the event of it being undertaken by colonial contractors, the labor should also be imported. The value of the contract is about $3,000,000, but should the work be done by local firms it is estimated that it will amount to $4,200,000. This is a serious difference, and one that can not be tolerated. The Edgemoor Iron-works Company of Wilmington, on the Delaware, erected some magnificent bridges in Australia, and possibly the company may be induced to compete for this work. When the bridge is completed there will be direct railway communication from Sydney to the northern district. At present there is a marine trip to the port of Newcastle and thence by the Northern Railway to the fertile agricultural lands and stanniferous regions of our New England district.

PENNSYLVANIA SCHUYLKILL VALLEY R. R. BRIDGE.—One of the chief items of expense in the construction of the new road will be the building of bridges. Besides the extensive and costly iron bridge across the Schuykill at Manayunk, another large iron bridge is to be built across Fayette street, in Conshohocken, a wooden bridge over Forest street, and also a number of stone bridges above that borough. A large iron bridge is to span Stony Creek at the western end of Norristown, and a stone bridge will be thrown across Saw Mill Run. Another entensive bridge will be built across Perkiomen Creek, the first trestle of which has been raised and is 40 ft. high.

Several of the larger bridges will be erected by Clark, Reeves & Co., of Phœnixville. Other bridges, the contracts for which have been awarded to Cofrode & Saylor, of the Philadelphia Bridge Co., at Pottstown, will be constructed as follows; Across the Schuykill in Pottsgrove Township, 660 ft. long; across the Schuykill at Douglassville, five miles above Pottstown, 660 ft. long; across the Maxatawny at Pottstown, 120 ft. in length; across the canal at Monocacy, Berks County, 160 ft. long; across the Canal at Frick's Lock, Chester County, 160 ft. long; two bridges across the Canal at Spring City, Chester County, each 160 ft. long.

BUILDINGS THAT RESIST EARTHQUAKES.—The volcanic eruptions in Java, the earthquake in Ischia, and our own Western tornadoes have probably caused much more destruction of life and property than they would have caused if buildings had been specially adapted to resist them. In Japan, where shocks of earthquake are frequent, it is not usual to dig foundations for any building, no matter how large or important it may be. Rocks slightly rounded at the top are placed where the four corners of the house are to be. The corner posts, also rounded at the end, rest on these. The timbers are all pinned together, not nailed, so as to allow of considerable movement without coming apart. In the central portion of the building the timbers are particularly heavy, and act as ballast. In high towers there are sometimes huge beams swung from the roof and reaching to within a foot of the ground, which prevent the building from being overturned either by earthquake or storm. The oldest building in Japan, the Treasury at Nara, is built in this manner, without the swinging beam, but with a very heavy ballast in the framework of the center of the floor. A well-known artist is the inventor of a painting hut which is constructed in part on the same principle. It rests on stones on the corners, the timbers are keyed together, and it carries a heavy ballast under the floor. It is, however, in addition, secured to the ground by ropes and anchors. This hut will outride a gale in perfect safety. Probably it would not withstand the force of a tornado; but it would whirl through the air without falling to pieces, and would reach the ground again right side up. A larger, heavier structure of the same sort might not be budged even by a tornado.

THE ANDERSON, KNIGHTSTOWN & RUSHVILLE (IND).—Railroad is projected.

THE ARKANSAS WESTERN RAILROAD.—This road is to be build from a point at or near McNeil Station, on the line of Texas & St. Louis Railroad, in Columbia County, to Fort Smith. This proposed line goes through Nevada, Hempstead, Pike, Clark, and Montgomery counties to a point known as the Fourche Divide, near the boundary line of the counties of Polk, Scott, Yell, and Montgomery; thence through the counties of Scott, Logan and Sebastian to Fort Smith. The estimated length of the road is 148 miles, and the cost of the construction is fixed at $1,875.000, which amount is also the capital stock of the company. George M. French is the Chief Engineer.

THE BEE LINE is contemplating a belt road round St. Louis at a cost of $4,000,000.

A DEEP CUT ON O. & Q. ROAD—Four miles from Agincourt Canada, 150 men are at work, under Mr. Booth, one of the firm of contractors, at one of the greatest pieces of earthwork in Canada. The cutting runs 35 ft. to grade, and is 4,700 ft. long, while the enbankment formed by the dump is about a mile long, and is 30 ft. high in places. Mr. Booth set to work and obtained a machine called a steam shovel, constructed in Toronto. This, though of unusual strength, was not equal to the work, so hard and tenacious was the material, even after it had been assisted by the earth being blasted with dualin. Recourse was had to another and stronger machine, and this is now penetrating the cutting at the rate of from 25 to the 30 ft. in the twenty-four hours. It has already been pushed once through. having taken a little less than half the total 35 ft. to be moved, six men are kept constantly blasting in advance.

CHARLEMAGNE'S BRIDGE OVER THE RHINE.—Near the close of the eighth century Charlemagne ordered the construction, over the Rhine, of a bridge resting on twenty-eight buttresses. The bridge was struck by lightning and burnt to the level of the water. German engineers are now removing the remains of the old structure, on the Mayence side. They have already taken out fifty piles, with the lengths of five or six meters (5,468 to 6,562 yards). The wood, which is nearly eleven hundred years old, is so well preserved that it can still be used in building; the iron, which was riveted to the posts, can also be used, since it is covered only with a thin layer of rust.—*Chron. Industr.*

CAPT. JOHN HALL, the alleged defaulting contractor of the Pennsylvania Railroad, was lately seen in Denver on his way to New Mexico.

WIDENING BANGOR (ME.) HARBOR.—A. C. Both, U. S. Government engineer, is to survey the present channel. It must be widened, it is thought, from 150 to 200 ft. at an expenditure of $150,000.

BRIDGE TRAVEL IN LONDON.—Proposals having been made for building a new bridge over the Thames, statistics have been collected to show the amount of travel over the present bridges. The following table shows the average daily travel over a few of the principal bridges:

	Pedestrians.	Vehicles.
London	110,525	22,242
Blackfriars	79,198	13,875
Westminster	44,460	11,750
Waterloo	32,815	10,370
Southwark	25,507	3,340
Vauxhall	17,828	5,453
Charing Cross	16,130	
Chelsea	14,500	2,338
Battersea	10,260	1,342

The addition of the other bridges gives a total of 384,042 pedestrians and 75,325 vehicles.—*Dingler's Journal, Jan.* 24, 1883.

KANSAS CITY SEWERS.—Bids for constructing the Lydia avenue main sewer, etc., were opened Sept. 3. There was but one bid, that of John Shaw, for the Lydia avenue sewer, and being considered too high, was rejected. On the Forest avenue sewer the bids were as follows: W. H. Faulkner, $14,711; John May, $11,762; John Shaw, $15,113; Thomas Fisher, $13,881. The contract was awarded to Mr. May. For the Campbell street sewer the bids were as follows: J. D. Hackett, $10,339; W. H. Faulkner, $8,074; John May, $7,435; Thomas Fisher, $9,815; John Shaw, $9,759. Mr. May was also awarded this contract.

MARTIN'S CREEK & STROUDSBURG RAILROAD.—HARRISBURG, Pa., Sept. 6.—A charter was issued this morning to the Martin's Creek & Stroudsburg Railroad Company to construct a line from Martin's Creek, on the dividing line between Pennsylvania and New Jersey, to Stroudsburg, Monroe County, a distance of 40 miles. The capital stock is $750,000.

PHILADELPHIA PUBLIC BUILDING BILLS.—The Public Building Commission have audited and approved the August batch of bills, amounting to $109,612.23. The largest bills were those of Struthers & Sons, white marble, $33,223.05; Cape Ann Granite Company, $24,239.45, and the Phœnix Iron Company, $25,484.34. A communication asking that the compensation of the architect and his assistants be advanced from $10,500 to $15,000 was deferred for further consideration.

TELEGRAPH CONTRACTS.—Contracts to the amount of $15,000,000 for the construction of new lines have been awarded by the Board of Trustees of the Postal Telegraph Company. Lines of two wires each will be put up from New York to Washington, New York to Boston, Buffalo to Pittsburgh, Fostoria, O., to Toledo, and Chicago to St. Louis. Two wires will be added to the wires already strung, between New York and Chicago. The lines are to be completed, according to the terms of the contract, by Jan. 1. The capacity of the copper wires now up between New York and Chicago is equal to twenty iron wires, and will be doubled by the additional two. John W. Mackey, the President, will leave for California in a few days, but he will see the work fairly under way before he leaves. The contractors begin at once.

THE ST. LOUIS, E. & W. ROAD.—Surveys are making at Appleton, Butler and other places where the people want to have connection with the line.

MINNEAPOLIS, SAULT STE. MARIE & ATLANTIC R. R.—A meeting of the directors of the Minneapolis, Sault Ste. Marie & Atlantic Railway Company was held in Minneapolis on the 28th ult., at which the following officers were elected: President, Hon. W. D. Washburn; Vice-President, C. A. Pillsbury; Secretary, M. P. Hawkins; Treasurer, J. K. Sidle. A thorough preliminary survey was ordered from Minneapolis to Florence on the northeastern boundary of Wisconsin on a direct line to the Sault. Two surveying parties will be sent out at once.

THE STANDARD SWITCH.—The organization of the Standard Switch Company is composed entirely of Topeka men. Its officers are D. J. Chase, President; W. A. Cooper, Vice President and Manager; H. V. Hinckley, Secretary and Treasurer; directors for the first year being D. J. Chase, A. A. Robinson, W. A. Cooper, H.V. Hinckley, C. K. Holliday, J. D. Burr and E. J. Beard. This company has expended already seventy thousand dollars for switch patents, and are pushing their introduction on Western roads, having them now in use on the A. T. & S. F., the K. C., Ft. S. & G., the U. P., the Mo. Pacific, the C. M. & St. P., the C. & N. W., the F. & P. M., and the D. & R. G., the two first mentioned roads having adopted them as standards.

NAPANEE, TAMWORTH & QUEBEC R. R.—From Belleville (Ont.) it is learned that arrangements have been completed for the immediate construction of the Napanee, Tamworth & Quebec Railway. Mr. Rathbun has been appointed managing director, and the necessary documents are being drawn by Mr. John Bell, Q. C.

DULUTH, SOUTH SHORE & SOUTHWESTERN RAILWAY COMPANY is the latest railroad scheme incorporated at Duluth. The incorporators are H. E. Long, W. J. Tranah, Vespasian Smith, Thomas W. Mayhew, Louis H. Grieser, Philip M. Graff and R. D. Mallet. All are residents of Duluth except Mr. Mayhew, who lives at Grand Marais. The capital stock of the company is put at $10,000,000, in 100 shares. The object of the company is to construct and operate a line of road from Duluth northeast as near as practicable to the lake shore, touching at Agate Bay, Beaver Bay, Grand Marais, and from thence to the northeast boundary of Minnesota, with one or more branches to the northern boundary of the State, and also from Duluth southwest of the boundary of the State, touching at or near the Northern Pacific junction Mille Lacs, St. Cloud, Litchfield, Redwood Falls, Tracy and Pipestone City, with one or more branches northwest and south of the main line to the boundary of the State.

ELECTRIC LIGHTING will be used for Kankakee (Ill.). Nine large towers have been built.

CHICAGO'S BRIDGES.—Mr. Thompson, formerly of the Board of Works, does not believe that the bridges of the city are properly cared for. The turntable of the State street bridge is not in order, but on the whole he believes that if not neglected all the bridges will last a long time yet.

RAILWAYS INTO MEMPHIS.—During 1883 some important roads were built, having Memphis as terminus. The Kansas City and Memphis branch to Springfield, 485 miles, is finished with the exception of eleven miles. The Kansas City, Fort Scott and Gulf will likely build the Hutton Valley & Poplar Bluff branch, and also a branch south to Arkansas. The grading on the Tennessee Southern is three-fourths completed from Memphis to New Orleans.

CLEVELAND WATER-WORKS.—The city of Cleveland is expending half a million of dollars in the construction of new storage reservoirs.

SPECIFICATION FOR HIGHWAY BRIDGE AT BOARDVILLE, N. J.—Plan No. 1. Five-panel transverse girders, 35 ft. long and 18 ft. roadway; all rivets to be machine-driven at the shops, all pinholes accurately bored; the wheel guards at ends to be returned around trusses so as to protect wheels from getting outside the guards; plan No. 1 to consist of a pair of sold riveted lattice girders, with top and bottom chords, angles rolled in one continuous piece without splices; plank to be 3-in. yellow pine in length of 18 ft., with guards of 6'x6' bolted down to the iron stringers every 4 to 5 ft.; all material to be the best of its kind, such as is required for good railroad work.

Bids: Riverside Bridge & Iron Co., $1,056; Union Bolt Works, $1,080. The Riverside Bridge Works received the contract.

PUMPING ENGINES.—E. P. Allis & Co., of Milwaukee, Wis., have the contract for the Allegheny, Pa., pumping engines, which are guaranteed to pump 6,000,000 gallons 220 ft. high every 24 hours.

POTOMAC FLATS.—The lowest bidder for filling in about six acres of the Potomac Flats, in the vicinity of Easby's Point, is Jonathon Taylor, of Washington, at 23½ cents per cubic yard; for dredging, John Van Patten, 11 cents per cubic yard.

MINERS' POWDER.—M. Michalowski, engineer at Mont-ceau-les-Mines, has invented a new blasting powder, which he has named miners' powder, for which he claims important advantages. The grains are irregular in shape, and of a slaty gray color, exactly resembling that of tea. Its density is slight, being only half that of ordinary blasting

powder; but this is not a disadvantage, as it can be compressed and rammed down without danger. It is extremely safe, as it is hardly possible to make it explode except under its proper conditions. If set fire to in the open air (which in itself is difficult to do), or in any receptacle that does not offer a considerable resistance, it fuses instead of exploding. If used in a gun, and rammed down only to the ordinary degree, it fuses, and pushes out the bullet; but if rammed more tightly, it bursts the barrel. The experiment was tried of setting fire to 25 lbs. of this powder, inclosed in a wooden case, the walls of which were 1¼ in. thick. The pressure of the gas evolved increased so slowly as to force the nails of the case, and lift the lid. It seems clear that there can be no danger of accidental explosion from such a powder; in a mine, it is fired with the ordinary miners' match.

DREDGING HUDSON RIVER.—The following contracts for dredging in Hudson River were awarded by Hon. James Shanahan, Supt. Public Works, Aug. 27, in pursuance of Chap. 451, Laws of 1883 of N. Y. State:

E. M. Payn & Co., Albany, New Baltimore, Mills' Light and 9-Mile Tree, 10$\frac{9}{10}$c. per cubic yard.

P. W. Myers, Albany, Parda Hook, 10$\frac{5}{8}$c. per cubic yard.

Bids were received as follows:

Payn, Albany, 11½ and 10$\frac{9}{10}$c. per cubic yard.

Myers, Albany, 11½, 11 and 10$\frac{5}{8}$c. per cubic yard.

John M. Seward, Albany, 20 and 28c. per cubic yard.

Manhattan Dredging Co., N. Y., 17c. per cubic yard.

J. D. Flannery, Jersey City, 16½, 11⅞, 13¼, 13c. per cubic yard.

PIPES AND CASTINGS FOR THE WATER-WORKS, WASHINGTON, D. C.—The following bids were opened Tuesday for furnishing and delivering 680 ft. of 75-in. pipe, 6,700 ft. of 48-in. pipe, 1,060 ft. of 12-in. pipe, 2,650 ft. of 8-in. pipe, 420 ft. of 6-in. pipe, aggregating about 3,000 tons of pipe castings, which will be required in the extension of the water supply:

Walker Wood, Philadelphia, 75-in. pipe, $50; 48-in., $37.70; 12-in., $41.75; 8-in., $42.90; 6-in., $43.50.

Andrew H. McNeal, Burlington, N. J., 75-in., $75; 48-in., $32.20; 12-in., $40; 8-in., $41; 6-in., $42.

Gloucester Iron Works, Philadelphia, 48-in., $45; 12-in., $42; 8-in., $43.37; 6-in., $14.80.

West Point Foundry Association, Cold Spring, N. Y., 75-in., $53.50.

Builders' Iron Foundry, Providence, R. I., 75-in., $69.

R. A. Ramsey, Baltimore, Md., 75-in., $44.95. This last bid was informal.

Andrew H. McNeal offered to furnish 75-in. pipe for less if the stipulated hydraulic test should not be required. The Builders' Iron Foundry, of Providence, made the same proposition.

THE DENVER SHORT LINE.—Mr. J. H. Carlile, a member of the contracting firm of Carlile, Corrigan & Co. was lately in Denver. He says there are now 1,500 men employed on the line between Leadville and Dalton, and that 500 more men will probably be put on.

THE ST. LOUIS WATER-WORKS.—Before the Investigating Committee, Mr. Whitman, now commissioner, stated that he was Chief Engineer on the construction of the works in 1867 and continued engineer till 1877. Mr. Whitman gave a general history of the water-works during his examination.

THE MEXICAN CENTRAL.—This road will be completed next May. Its length is 1,230 miles, from El Paso, Tex., to the City of Mexico. The work of construction is being prosecuted from both ends with all the rapidity possible. From El Paso 500 miles are finished and from the City of Mexico about 340, leaving 380 miles of track yet to be laid. The work at the south end has been greatly delayed by a long, deep gulch, which it is expected will be crossed by Sept. 1. The grading north of this gulch to Zacatecas, a distance of 100 miles, is practically completed.

A UTAH ROAD.—Sir Henry Tyler of the Grand Trunk was lately in Salt Lake inspecting the San Pete road, which it is intended to develop into a local railway system.

PUMPING ENGINE.—M. T. Davidson & Co. have the contract for a new 5,000,000-gallon pumping engine for Brooklyn.

AN EXTENSION OF THE WHEELING, OHIO AND LAKE ERIE is spoken of. The line would run from Huron to Fairfield.

THE VANDERBILT LINES IN PENNSYLVANIA.—The astounding preponderance of the Vanderbilt system and its future influence in the coal and iron regions of Pennsylvania may be seen from the following summary in an Ohio paper: "Philadelphia & Reading gives entrance to New York, Philadelphia, and Harrisburg. The Pittsburg & Lake Erie, lately passed into Mr. Vanderbilt's hands, gives line connection with Lake Shore. Contracts for grading the Harrisburg & Western, 220 miles long, to be built by the Vanderbilt-Gowen syndicate, will be let this fall. The Pittsburg, McKeespost & Youghiogheny will be opened this month. The Youghiogheny road passes between the banks of the Monongahela and the tracks of the Pittsburg, Virginia & Charleston to Homestead, where it crosses the river. It recrosses the Mononagahela at McKeesport, and then follows the left bank of the Youghiogheny to Dawson. From Dawson there is a four-mile branch along Dickerson Run for coal and coke. The road is building to Bradford, where the West Youghiogheny Branch, which has passed out of the hands of the Baltimore & Ohio, connects the road with Connellsville. By this road, which runs to Summit, near Scotdale, and is being extended to Mount Pleasant, Mr. Vanderbilt will get a large coal traffic. A branch to Uniontown for a coke traffic, and to Bellevernon, on the Monongahela East Shore road, to the undeveloped coal country, is projected. The construction of a branch line of eighty-nine miles to the Virginia State line, to be known as the Monongahela East Shore Road, was begun two weeks ago. This road begins at McKeesport and runs to Port Marion. It will go into the rich mineral section of Virginia, and will open up an iron trade which may seriously interfere with Lake Superior and foreign ores. The Baltimore & Ohio people have not been idle during the activity of the Pennsylvania and Vanderbilt people. During the year they have purchased the Pittsburgh Southern road, between Pittsburgh and Washington, Pa., and built the Streets Run Branch to connect with it. This new road, in connection with the Washington & Wheeling Railroad, gives a direct line from Wheeling to Pittsburgh, and saves a haul of 100 miles in reaching the southwest connections of Baltimore & Ohio.

THE CONTRACT FOR THE NEBRASKA STATE HOUSE has been before the courts. R. D. Silver's bid was $41,000 lower than that of W. Stout, but the latter received the contract. A mandamus was refused.

THE INCREASE IN TEXAS WEALTH is wonderful. Some counties report as high as $2,000,000. The complete returns show the State richer in value than this time last year by 100 million dollars.

THE ST. LOUIS, EMPORIA AND WESTERN will be surveyed at once. Engineer Emerson is at Warsaw, Mo. The Osage River will be bridged some 40 or 50 miles east of Warsaw.

THE CINCINNATI ELEVATED RAILROAD has been squelched by a resolution of the Board of Public Works.

THE TERRITET MONTREUX CHILLON RAILWAY.—This new Swiss road was opened to the public on Aug. 18. The engineer and builder was Mr. Riggenbach, the inventor of the Righi railway system, and this road is the same in all respects to the latter excepting the motive power, which is water instead of steam. The Chillon Railway, starting about a quarter of a mile on the Vevey side of the Castle of Chillon, goes straight up the mountain side to Glion; it is nearly 2,300 ft. long, and the gradient is 57 per cent. Under the carriage, and on an independent line of rails, is another carriage carrying a tank which is filled with water at the top of the hill. The two carriages are connected by a wire cable passing over a large pulley at the summit; and as the tank, when filled, is the heavier of the two carriages, it descends its line of rails and draws the passenger coach from the bottom to the top of the incline; the reverse motion is obtained by emptying the tank carriage at the bottom of the hill. As in the Righi Railway there are three lines of rails on each track, with a center brake wheel and clogged rail.

THE PROPOSED PALESTINE CANAL.—Mr. H. J. Martin is the English engineer. The purpose of the canal is to open communication between the Mediterranean and the Red Sea by means of depressed gorge of the River Jordan and the Dead Sea. Two canals will be needed, one from the Bay of Aero to the northern end of the Jordan valley, the other from its southern end along the Waddy-Arabah to the Red Sea. The first would be 25 miles long and presents few engineering difficulties; the other would be much more troublesome, owing to loss by evaporation; the channel would have to be large enough to carry a million cubic yards of water per minute for three years. The Sultan of Turkey objects to the scheme.

THE SABINE PASS AS AN OUTLET ON THE GULF.—A correspondent of the New York *Sun* refers to the far-reaching prospects of the Sabine Pass. There are now six railroads in actual process of construction to this harbor; three others have been chartered and surveyed from Houston, Denison and Tyler, and two others have been chartered from the Louisiana side of the Pass to Natchitoches and Vicksburg. The harbor at Sabine Pass is eight miles long, one mile wide, and has a depth of from 25 to 45 ft., within the bar; the present depth on the bar is 18 ft. which is now being deepened by the United States. It is the only harbor on the coast with a mud bar. A natural breakwater, called Red Snapper Bar, is located at right angles with the mouth of the Pass. This breakwater is 20 miles long and 4 miles wide, and 8 miles from the Pass. During the cyclones which threatened Galveston and destroyed Calcasien, the tidal waves were rendered harmless by this bar.

THE OREGON SHORT LINE has a difficult route, according to Mr. Moscript, civil engineer, who has been surveying a line down Snake River from the mouth of Burnt River. He calculates the road will cost $30,000 per mile all the way, but says it can be built in a year. The distance is 187½ miles. The river falls only seven and one-half ft. on an average per mile. The heaviest grades will not be more than fifteen ft. to the mile. This will be through the canyon below the old Brownlee ferry. This canyon commences fifteen miles below this ferry and extends to a distance of thirty miles. The line he surveyed crosses the river from this side to the Oregon side, crosses back and runs all the rest of the way down the river, and crosses the mouth of the Clearwater at Lewiston. Chief Engineer Clarke is expected shortly to go over the route.

THE ST. LOUIS WATER-WORKS—MR. CHAPHE'S REPORT.—The special committee to investigate the water-works examined Mr. Chaphe last week. He testified that he was chief mechanical engineer of the water-works, and had held the position about twelve years—from the time the works commenced supplying the city with water. Had charge of the construction of the works, representing the Knapp Foundry of Pittsburgh; came to St. Louis at the personal solicitation of Mr. Whitman from Brooklyn, N. Y., where he had charge of the water-works there. It was in the spring of 1868 that he was first requested to take charge of the construction of the machinery. Mr. Whitman came to him and begged him to come, when he consented. Mr. Whitman made no contract with him for services, but the Knapp Company agreed to give him $3,000 per year, but afterward, without any solicitation from him, gave him $10 per day. His connection with the Knapp Foundry Company terminated in 1871, and he then entered the service of the city.

IRON AND METAL MARKETS.

PHILADELPHIA, Sept. 6.

Iron quotations are unchanged, and the only transactions heard of are at old rates. Sales are frequent in 50 and 100 ton lots at $22@$22.50 for No. 1, and $20 for No. 2. The downward tendency has exhausted itself. Mill irons are firm at $17@$17.50@$18 at furnace, and $18.50@$19 for special brands. A sale of 1,000 tons Spiegeleisen was made at $30.75 for New York shipment. Sales of charcoal blooms at $58. Muck bars at $32.75. Refined iron is weak, though a large business has been transacted at 2.15@2.20c. Consumers think these the lowest probable figures, and hence are supplying themselves more liberally. All mills are at work. Nails are in active request at $3@$3.10. There is great activity in building circles, and the demand for building material is steady. The car shops throughout the east are crowded. The Bridge Works' capacity is oversold, and the shipyards employ a full complement of hands.

Heavy contracts for pipe for water, gas, steam, and to convey natural gas from wells to points of consumption, have been given out. Plate iron is strong and active. Winter deliveries of steel rails have been placed at $37.

PITTSBURGH, SEPT. 6.

Business in iron has fallen off during the past week, for some unaccountable reason, but the producing interests are in nowise concerned at the aspect. The heavy consumptive requirements will create a demand for crude and finished iron. The summer has been a comparatively active one. Gray Forge sells at $17.50. Foundry at $18@20. Muck Bars have declined to $33.50. Merchant Bars are quoted at 1.90@2c., but in some cases sell between these figures. Some manufacturers decline to book late orders at inside prices, anticipating an improvement during this month. Orders have been placed at 1.80c. The Nail Association meets on Wednesday of next week to consider the propriety of another shut down. The current of opinion is against it at present. Inside prices are $2.84. Demand fair. Orders for wrought pipe have been taken at 75 per cent. off. Boiler tubes at 60 off. Steel rail orders were taken for winter delivery at $37. Old rails are held higher. Americans, 1,000 tons sold at $24. A fair amount of business is done in Merchant steel. Cropends $24.50.

CHICAGO.

Trade is fairly active in all departments. Consumers of agricultural steel are placing their requirements for the fall. A slight decline has taken place in nails. Card rates, $3@$3.10. Southern crude irons are active. Merchant iron, 2.05@2.10c. Sheet copper is dull. Stamped tinware is improving. Pig tin is weak at $22¾. Pig lead is strong and steady. Hardware is in improving request. Shelf, heavy and builders' hardware are all under good inquiry. Steel rails, $40.